

**REPORT OF  
AIR POLLUTION SOURCE TESTING  
OF AN ETHYLENE OXIDE EMISSION-CONTROL SYSTEM  
OPERATED BY STERIGENICS U.S., LLC.  
IN CHARLOTTE, NORTH CAROLINA  
ON NOVEMBER 13, 2015**

Submitted to:

**MECKLENBURG COUNTY DEPARTMENT OF ENVIRONMENTAL PROTECTION  
700 North Tryon Street, Suite 205  
Charlotte, North Carolina 28202-2236**

Submitted by:

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**Permit Number 14-017-959**

Prepared by:

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Prepared on:

**December 1, 2015**

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### TEST DATE

Friday, November 13, 2015

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## **1.0 INTRODUCTION**

On Friday, November 13, 2015, ECSi performed air pollution source testing of an ethylene oxide (EtO) emission-control system operated by Sterigenics U.S., LLC. in Charlotte, North Carolina. The control device tested is an Anguil catalytic oxidizer, which is currently used to control emissions from nine EtO sterilizer backvents and two aeration rooms. The purpose of the testing program was to evaluate continued compliance with EPA requirements under the current National Emissions Standards for Hazardous Air Pollutants (NESHAP), and with the conditions established in the Air Quality Permit granted to Sterigenics, Inc. by the Mecklenburg County Department of Environmental Protection (MCDEP).

## 2.0 EQUIPMENT

The EtO gas-sterilization system is comprised of nine commercial sterilizers, all discharging through dry screw or liquid-ring vacuum pumps to an Advanced Air Technologies packed-tower acid scrubber emission control device. The nine sterilization chamber backvents and four aeration rooms are all discharged to an Anguil catalytic oxidizer emission-control device. The gas-sterilization and emission-control equipment consists of the following:

- Nine Gas Sterilizers, each comprised of a steam-heated sterilization chamber (varying in size from 2500 to 5300 cubic foot volume), a dry screw or liquid ring recirculating vacuum pump chamber evacuation system (“chamber vacuum vent”), and a backdraft valve (“chamber exhaust vent”);
- Four aeration rooms, each comprised of a heated aeration chamber and a chamber exhaust system

Sterilizer vacuum pump emissions are controlled by:

- One Advanced Air Technologies Safe Cell emission-control system, comprised of a packed-tower chemical scrubber, equipped with a packed reaction/interface column, a scrubber fluid recirculation system, a scrubber fluid reaction/storage tank, and a dedicated blower exhaust system.

Sterilizer backvent and aeration cell/room emissions are controlled by:

- One Anguil Catalytic Oxidizer, rated at 10,000 SCFM, equipped with a prefilter, a natural gas heater, an exhaust gas heat exchanger, two reactive catalyst beds, and an exhaust blower.

### **3.0 TESTING**

EtO source testing was conducted in accordance with the procedures outlined in USEPA CFR40, Part 63.365. EtO emissions monitoring for each test run was conducted simultaneously at the inlet and outlet of the catalytic oxidizer during chamber backvent, and during a one-hour interval of the 24-hour aeration process. A total of three chamber backvent test runs, and three one-hour aeration test runs, were performed.

During backvent and aeration testing, EtO emissions at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product. The testing program was conducted in accordance with the procedures outlined in the following sections.

## 4.0 RULE/COMPLIANCE REQUIREMENTS

The EtO gas-sterilization system at Sterigenics U.S., LLC. was tested to determine compliance with the current federal EPA National Emissions Standard for Hazardous Air Pollutants (NESHAP) for ethylene oxide, and with the requirements specified in the MCDEP Permit. The current testing was performed to demonstrate continued compliance with the following requirements:

- The emissions from the sterilization chamber exhaust vents (backvents) must be discharged to control equipment with an EtO emission-reduction efficiency of at least 99.0% by weight.
- The emissions from the aeration process must be discharged to control equipment with an EtO emission-reduction efficiency of at least 99.0% by weight.

Testing is required to demonstrate compliance with these requirements. Source testing of the emission-control device is required annually, in accordance with the conditions established in the permit granted by the MCDEP.

## **5.0 TEST METHOD REFERENCE**

### **5.1 INTRODUCTION**

The testing procedures outlined herein are based on USEPA source-sampling methods. EtO control efficiency and mass-emissions testing were conducted by USEPA CFR40, Part 63.365, and in accordance with MCDEP requirements. EtO emissions monitoring for each test run was conducted simultaneously at the inlet and outlet of the catalytic oxidizer during chamber backvent, and during a one-hour interval of the 24-hour aeration process. A total of three chamber backvent test runs, and three one-hour aeration test runs, were performed.

During backvent and aeration testing, EtO emissions at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product.

Operation and documentation of process conditions was performed by personnel from Sterigenics using existing monitoring instruments installed by the manufacturer on the equipment to be tested. In accordance with the procedures established in USEPA CFR40, Part 63, Subpart O, the following parameters were recorded: inlet and outlet catalyst bed temperature, pressure drop across the catalyst bed, and flow rate through the oxidizer.

### **5.2 VOLUMETRIC FLOW MEASUREMENT**

Exhaust gas flow at the outlet of the catalytic oxidizer was determined by EPA Method 2C using a standard pitot tube and an inclined-oil manometer. Sampling ports were installed in accordance with EPA Method 1, and were located far enough from any flow disturbances to permit accurate flow measurement.

Temperature measurements were obtained from a type K thermocouple and thermometer attached to the sampling probe. Exhaust gas composition was assumed to be air and small amounts of water vapor. Water vapor was negligible, at about 3 percent.

### **5.3**

### **CONTROL EFFICIENCY AND MASS EMISSIONS MEASUREMENT**

During backvent and aeration testing, EtO emissions at the inlet and outlet of the catalytic oxidizer were determined using direct source sample injection into the GC. The mass of EtO emitted to the inlet and from the outlet was determined using the equation shown below in Section 5.9. Mass-mass control-efficiency of EtO during the backvent and aeration phases was calculated by comparing the mass of EtO vented to the system inlet to the mass of EtO vented from the system outlet.

During the backvent and aeration phases, vented gas was analyzed by an SRI, Model 8610, portable gas chromatograph (GC), equipped with the following: dual, heated sample loops and injectors; dual columns; and dual detectors. A flame ionization detector (FID) was used to quantify inlet EtO emissions, and a photoionization detector (PID) was used to quantify low-level EtO emissions at the emission-control device outlet.

### **5.4**

### **SAMPLE TRANSPORT**

Source gas was pumped to the GC at approximately 1000 cubic centimeters per minute (cc/min) from the sampling ports through two lengths of Teflon® sample line, each with a nominal volume of approximately 75 cubic centimeters (cc) and an outer diameter of 0.25 inch. At the inlet, the sampling port was located in the common backvent/aeration discharge duct, upstream of the oxidizer. At the outlet of the catalytic oxidizer, sampling ports were located in the exhaust stack downstream of the catalyst bed.

### **5.5**

### **GC INJECTION**

Source-gas samples were then injected into the GC which was equipped with two heated sampling loops, each containing a volume of approximately 2cc and maintained at 100 degrees Celsius (C). Injections occurred at approximately five minute intervals during the aeration-phase testing. Helium was the carrier gas for both the FID and PID.

### **5.6**

### **GC CONDITIONS**

The packed columns for the GC were both operated at 80 degrees C. The columns were stainless steel, 6 feet long, 0.125 inch outer diameter, packed with 1 percent SP-1000 on 60/80 mesh Carbopack B.

During the analysis, the FID was operated at 250 degrees C. The support gases for the FID were helium (99.999% pure), hydrogen (99.995% pure) and air (99.9999% pure). Any unused sample gas was vented from the GC system back to the inlet of the control device being tested.

## 5.7 CALIBRATION STANDARDS

The FID was calibrated for mid-range part-per-million-by-volume (ppmv) level analysis using gas proportions similar to the following:

- 1) 1,000 ppmv EtO, balance nitrogen
- 2) 100 ppmv EtO, balance nitrogen
- 3) 50 ppmv EtO, balance nitrogen (audit gas)
- 4) 10 ppmv EtO, balance nitrogen
- 5) 1 ppmv EtO, balance nitrogen

The PID was calibrated for low-range ppmv level analyses using gas proportions similar to the following:

- 1) 100 ppmv EtO, balance nitrogen
- 2) 50 ppmv EtO, balance nitrogen (audit gas)
- 3) 10 ppmv EtO, balance nitrogen
- 4) 1 ppmv EtO, balance nitrogen

Each of these calibration standards was in a separate, certified manufacturer's cylinder. Copies of the calibration gas laboratory certificates are attached as Appendix I.

## 5.8 SAMPLING DURATION

Backvent testing was performed in conjunction with normal production operations, during the chamber exhaust venting which is conducted for each sterilization chamber upon conclusion of the sterilization cycle, immediately prior to and during chamber unloading. Backvent sampling duration was 15 minutes for each of the three test runs.

Since aeration is a 24-hour process at this facility, with constant discharge flow from the aeration chambers to the emission-control system, aeration testing consisted of three 1-hour test runs. Each test run was performed with freshly sterilized product in the aeration chambers.

## 5.9 CONTROL-EFFICIENCY/MASS-EMISSIONS CALCULATIONS

Mass emissions of EtO during aeration were calculated using the following equation:

$$\text{MassRate} = (\text{VolFlow})(\text{MolWt})(\text{ppmv EtO}/10^6)/(\text{MolVol})$$

Where:

MassRate	=	EtO mass flow rate, pounds per minute
VolFlow	=	Corrected volumetric flow rate, standard cubic feet per minute at 68 degrees F
MolWt	=	44.05 pounds EtO per pound mole
ppmv EtO	=	EtO concentration, parts per million by volume
$10^6$	=	Conversion factor, ppmv per "cubic foot per cubic foot"
MolVol	=	385.32 cubic feet per pound mole at one atmosphere and 68 degrees F

Mass-mass control efficiency of EtO was calculated for backvent and aeration. Results of the control-efficiency testing are presented in Tables 1, 2 and 3.

## 6.0 TEST SCENARIO

The backvent and aeration testing was performed during normal process load conditions. Three backvent and three aeration test runs were conducted in series to verify the performance of the emission-control device. The testing schedule was as follows:

- 1) Testing equipment was set up and calibrated.
- 2) Backvent Phase Test Run #1 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 3) Aeration Phase Test Run #1 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 4) Backvent Phase Test Run #2 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 5) Aeration Phase Test Run #2 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 6) Backvent Phase Test Run #3 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 7) Aeration Phase Test Run #3 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 8) Post calibration check was performed, testing equipment was packed.

## **7.0 QA/QC**

### **7.1 FIELD TESTING QUALITY ASSURANCE**

At the beginning of the test, the sampling system was leak checked at a vacuum of 15 inches of mercury. The sampling system was considered leak free when the flow indicated by the rotameters fell to zero.

At the beginning of the test, a system blank was analyzed to ensure that the sampling system was free of EtO. Ambient air was introduced at the end of the heated sampling line and drawn through the sampling system line to the GC for analysis. The resulting chromatogram also provided a background level for non-EtO components (i.e. ambient air, carbon dioxide, water vapor) which are present in the source gas stream due to the ambient dilution air which is drawn into the emission-control device, and due to the destruction of EtO by the emission-control device which produces carbon dioxide and water vapor. This chromatogram, designated AMB, is included with the calibration data in Appendix A.

### **7.2 CALIBRATION PROCEDURES**

The GC system was calibrated at the beginning and conclusion of each day's testing. Using the PeakSimple II analytical software, a point-to-point calibration curve was constructed for each detector. A gas cylinder of similar composition as the calibration gases, but certified by a separate supplier, was used to verify calibration gas composition and GC performance.

All calibration gases and support gases used were of the highest purity and quality available. A copy of the laboratory certification for each calibration gas is attached as Appendix I.

## **8.0 TEST RESULTS**

The catalytic oxidizer was found to have an average EtO control efficiency of 99.98 percent for backvent, and an average EtO control efficiency of 99.97 percent for aeration. In accordance with state and federal requirements, backvent and aeration discharge streams must be vented to control equipment with an EtO emission-reduction efficiency of at least 99 percent by weight. The catalytic oxidizer met this requirement.

The test results are summarized in Tables 1, 2 and 3. These tables include results for EtO control efficiency and mass emissions of the emission-control device. Chromatograms and chromatographic supporting data are attached as Appendices A through G. Copies of field data and calculation worksheets are attached as Appendix H.

## TABLES

**TABLE 1**  
**ETHYLENE OXIDE CONTROL EFFICIENCY - AERATION**  
**OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE**  
**OPERATED BY STERIGENICS U.S., LLC.**  
**IN CHARLOTTE, NORTH CAROLINA**  
**ON NOVEMBER 13, 2015**

<b>RUN NUMBER</b>	<b>INJECTION TIME</b>	<b>INLET ETO CONC. (PPM)(1)</b>	<b>OUTLET ETO CONC. (PPM)(2)</b>	<b>ETO CONTROL EFFICIENCY</b>
1(3)	848	26.0	0.01	99.9615
1	853	27.2	0.01	99.9632
1	858	28.5	0.01	99.9649
1	903	28.3	0.01	99.9647
1	908	28.8	0.01	99.9653
1	913	28.2	0.01	99.9645
1	918	27.7	0.01	99.9639
1	923	27.4	0.01	99.9635
1	928	28.1	0.01	99.9644
1	933	27.0	0.01	99.9630
1	938	27.3	0.01	99.9634
1	943	27.2	0.01	99.9632
2(4)	1037	52.1	0.01	99.9808
2	1042	41.2	0.01	99.9757
2	1047	39.2	0.01	99.9745
2	1052	39.1	0.01	99.9744
2	1057	38.2	0.01	99.9738
2	1102	37.6	0.01	99.9734
2	1107	42.1	0.01	99.9762
2	1112	41.6	0.01	99.9760
2	1117	40.8	0.01	99.9755
2	1122	40.4	0.01	99.9752
2	1127	39.4	0.01	99.9746
2	1132	36.3	0.01	99.9725
3(5)	1237	35.8	0.01	99.9721
3	1242	36.1	0.01	99.9723
3	1247	35.4	0.01	99.9718
3	1252	35.6	0.01	99.9719
3	1257	34.5	0.01	99.9710
3	1302	35.8	0.01	99.9721
3	1307	34.9	0.01	99.9713
3	1312	36.0	0.01	99.9722
3	1317	36.1	0.01	99.9723
3	1322	35.7	0.01	99.9720
3	1327	35.9	0.01	99.9721
3	1332	36.4	0.01	99.9725
<b>TIME-WEIGHTED AVERAGE:</b>		<b>34.66</b>	<b>0.0100</b>	<b>99.9703</b>
<b>MCDEP REQUIRED CONTROL EFFICIENCY:</b>				<b>99%</b>

Notes:

- (1) - PPM = parts per million by volume
- (2) - 0.01 ppm is the quantification limit for the detector used at the outlet.
- (3) - Aeration Phase Test Run #1 started at 08:45, ended at 09:45.
- (4) - Aeration Phase Test Run #2 started at 11:14, ended at 12:14.
- (5) - Aeration Phase Test Run #3 started at 12:35, ended at 13:35.

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**TABLE 2**  
**ETHYLENE OXIDE CONTROL EFFICIENCY - BACKVENT**  
**OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE**  
**OPERATED BY STERIGENICS U.S., LLC.**  
**IN CHARLOTTE, NORTH CAROLINA**  
**ON NOVEMBER 13, 2015**

<b>RUN NUMBER</b>	<b>INJECTION TIME</b>	<b>INLET ETO CONC. (PPM)(1)</b>	<b>OUTLET ETO CONC. (PPM)(2)</b>	<b>ETO CONTROL EFFICIENCY</b>
1(3)	1017	36.6	0.01	99.9727
1	1018	37.3	0.01	99.9732
1	1019	526	0.01	99.9981
1	1020	228	0.01	99.9956
1	1022	131	0.01	99.9924
1	1023	111	0.01	99.9910
1	1024	74.0	0.01	99.9865
1	1025	70.5	0.01	99.9858
1	1026	68.9	0.01	99.9855
1	1028	65.5	0.01	99.9847
1	1029	64.1	0.01	99.9844
2(4)	1220	32.7	0.01	99.9694
2	1221	30.5	0.01	99.9672
2	1222	110	0.01	99.9909
2	1223	77.9	0.01	99.9872
2	1224	71.4	0.01	99.9860
2	1225	66.7	0.01	99.9850
2	1226	64.5	0.01	99.9845
2	1228	61.9	0.01	99.9838
2	1229	61.3	0.01	99.9837
2	1230	61.3	0.01	99.9837
2	1232	60.2	0.01	99.9834
2	1233	58.1	0.01	99.9828
3(5)	1424	37.2	0.01	99.9731
3	1425	37.3	0.01	99.9732
3	1426	204	0.01	99.9951
3	1427	108	0.01	99.9907
3	1429	71.0	0.01	99.9859
3	1430	58.4	0.01	99.9829
3	1431	52.4	0.01	99.9809
3	1432	51.0	0.01	99.9804
3	1434	48.8	0.01	99.9795
3	1435	48.7	0.01	99.9795
3	1437	48.8	<u>0.01</u>	<u>99.9795</u>
<b>TIME-WEIGHTED AVERAGE:</b>		<b>86.32</b>	<b>0.0100</b>	<b>99.9835</b>
<b>MCDEP REQUIRED CONTROL EFFICIENCY:</b>				<b>99%</b>

Notes:

- (1) - PPM = parts per million by volume
- (2) - 0.01 ppm is the quantification limit for the detector used at the outlet.
- (3) - Backvent Phase Test Run #1 started at 10:16, ended at 10:31.
- (4) - Backvent Phase Test Run #2 started at 12:19, ended at 12:34.
- (5) - Backvent Phase Test Run #3 started at 14:23, ended at 14:38.

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**TABLE 3**  
**ETHYLENE OXIDE MASS CONTROL EFFICIENCY**  
**OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE**  
**OPERATED BY STERIGENICS U.S., LLC.**  
**IN CHARLOTTE, NORTH CAROLINA**  
**ON NOVEMBER 13, 2015**

<u>SAMPLING LOCATION</u>	<u>STACK FLOW(1)</u>	<u>AVERAGE ETO CONC. (2)</u>	<u>ETO MASS FLOW(3)</u>	<u>ETO MASS FLOW(4)</u>
<b>RUN #1 BACKVENT:</b>				
Oxidizer Inlet	10700 DSCFM	128.4 ppm	0.101654 lbs/min	6.09924 lbs/hr
Oxidizer Outlet	10700 DSCFM	0.0100 ppm	0.000008 lbs/min	0.00475 lbs/hr
<b>ETO MASS CONTROL EFFICIENCY:</b>				<b>99.992%</b>
<b>RUN #2 BACKVENT:</b>				
Oxidizer Inlet	10700 DSCFM	63.04 ppm	0.049909 lbs/min	2.99452 lbs/hr
Oxidizer Outlet	10700 DSCFM	0.0100 ppm	0.000008 lbs/min	0.00475 lbs/hr
<b>ETO MASS CONTROL EFFICIENCY:</b>				<b>99.984%</b>
<b>RUN #3 BACKVENT:</b>				
Oxidizer Inlet	10700 DSCFM	69.60 ppm	0.055102 lbs/min	3.30613 lbs/hr
Oxidizer Outlet	10700 DSCFM	0.0100 ppm	0.000008 lbs/min	0.00475 lbs/hr
<b>ETO MASS CONTROL EFFICIENCY:</b>				<b>99.986%</b>
<b>RUN #1 AERATION:</b>				
Oxidizer Inlet	10700 DSCFM	27.64 ppm	0.021883 lbs/min	1.31295 lbs/hr
Oxidizer Outlet	10700 DSCFM	0.0100 ppm	0.000008 lbs/min	0.00475 lbs/hr
<b>ETO MASS CONTROL EFFICIENCY:</b>				<b>99.964%</b>
<b>RUN #2 AERATION:</b>				
Oxidizer Inlet	10700 DSCFM	40.67 ppm	0.032198 lbs/min	1.93190 lbs/hr
Oxidizer Outlet	10700 DSCFM	0.0100 ppm	0.000008 lbs/min	0.00475 lbs/hr
<b>ETO MASS CONTROL EFFICIENCY:</b>				<b>99.975%</b>
<b>RUN #3 AERATION:</b>				
Oxidizer Inlet	10700 DSCFM	35.68 ppm	0.028248 lbs/min	1.69487 lbs/hr
Oxidizer Outlet	10700 DSCFM	0.0100 ppm	0.000008 lbs/min	0.00475 lbs/hr
<b>ETO MASS CONTROL EFFICIENCY:</b>				<b>99.972%</b>

**Notes:**

(1) - DSCFM = Dry Standard Cubic Feet per Minute

(2) - ppm = parts per million by volume

(3) - lbs/min = pounds per minute

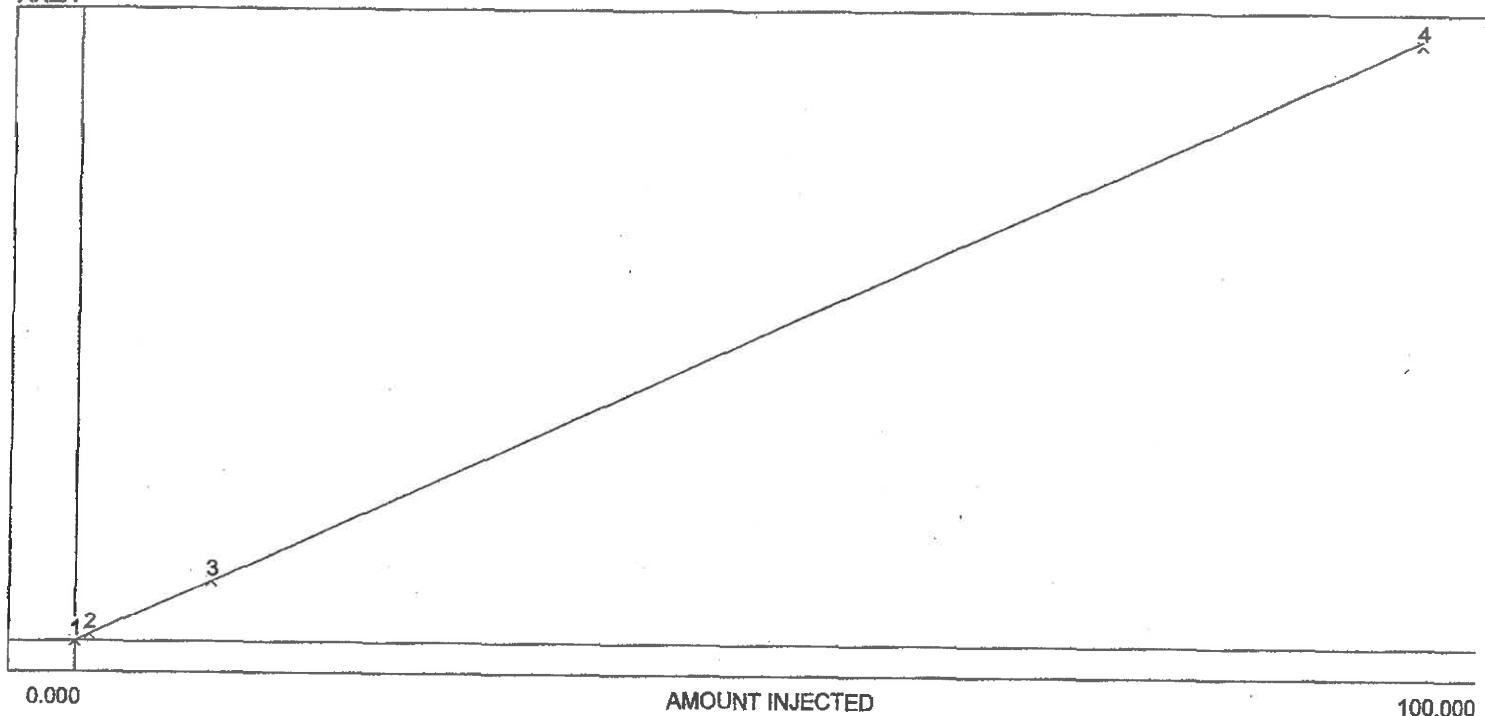
(4) - lbs/hr = pounds per hour

## **APPENDICES**

**APPENDIX A**  
**Calibration Data**

rk	Name	Start	End	Calibration	Int.Std	Units
	Dead Vol / Air	0.000	0.350		0.000	
	Ambient H2O	0.350	0.490		0.000	
	Ethylene Oxide	0.490	0.590	C:\peak359\1Ster	0.000015ppm	
	Acetaldehyde	0.590	0.800		0.000	
	CO2	0.800	1.000		0.000	

AREA



slope of curve: 0.09

xis intercept: 0.00

earity: 1.00

nber of levels: 4

'rel SD of CF's: 0.0/66.7

.0893X

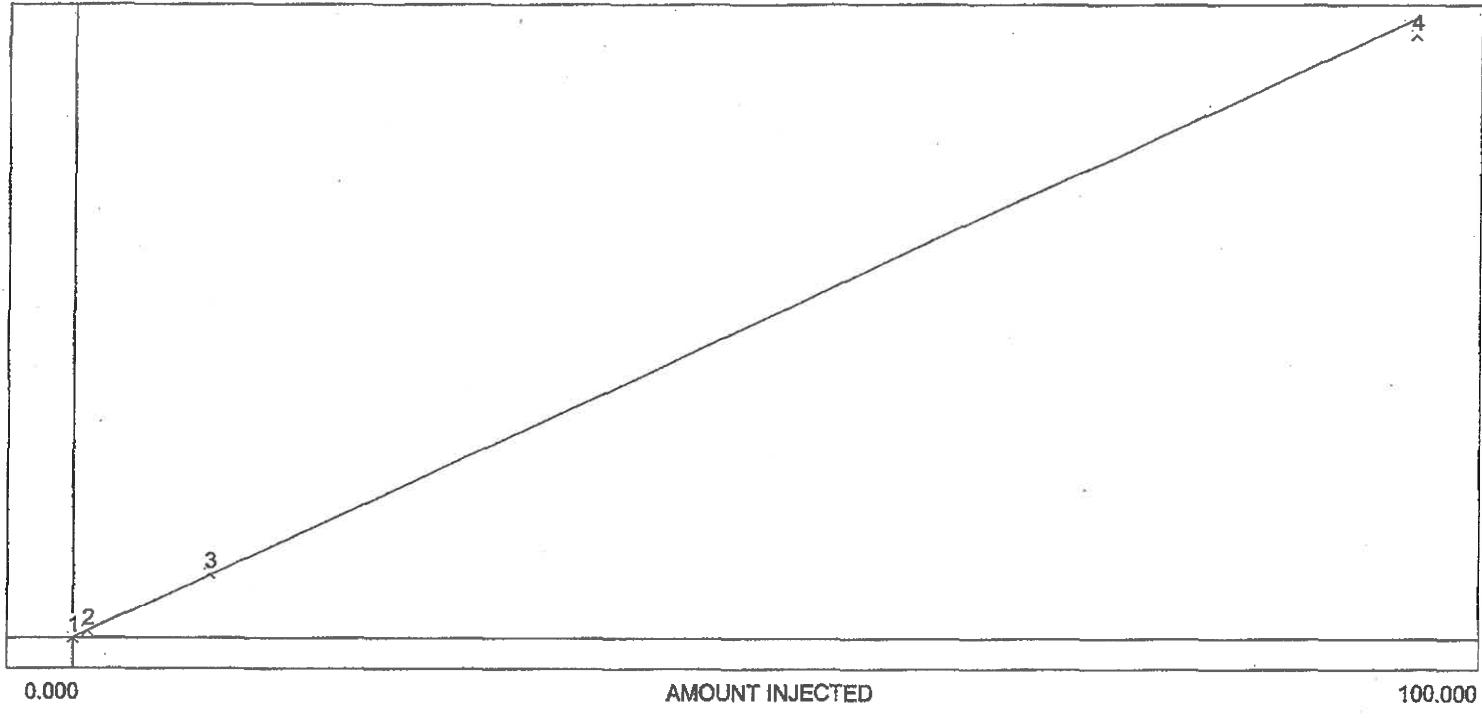
1.0000

t calibrated: Fri Nov 13 04:49:15 2015

Area/ht.	Amount	CF	Current	Previous #1	Previous #2
0.000	0.000	0.000	0.000	N/A	N/A
0.098	1.100	0.089	0.098	N/A	N/A
0.910	10.100	0.090	0.910	N/A	N/A
8.870	100.000	0.089	8.870	N/A	N/A

rk	Name	Start	End	Calibration	Int.Std	Units
	Dead Vol / Air	0.000	0.350		0.000	
	Ambient H2O	0.350	0.490		0.000	
	Ethylène Oxide	0.490	0.600	C:\peak359\2Ster	0.000	15ppm
	Acetaldehyde	0.600	0.800		0.000	
	CO2	0.800	1.000		0.000	

AREA



0.000

AMOUNT INJECTED

100.000

slope of curve: 1.26

xis intercept: 0.00

arity: 1.00

nber of levels: 4

rel SD of CF's: 0.6/66.7

.2636X

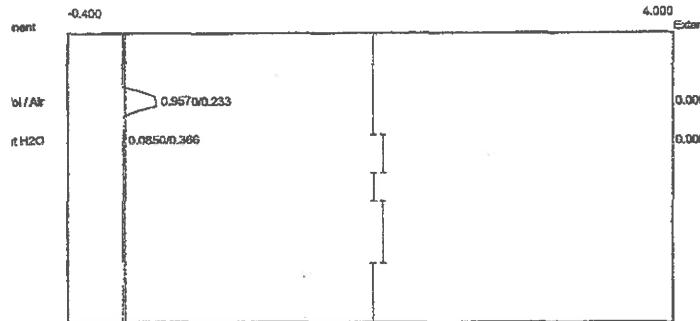
1.0000

calibrated: Fri Nov 13 04:48:30 2015

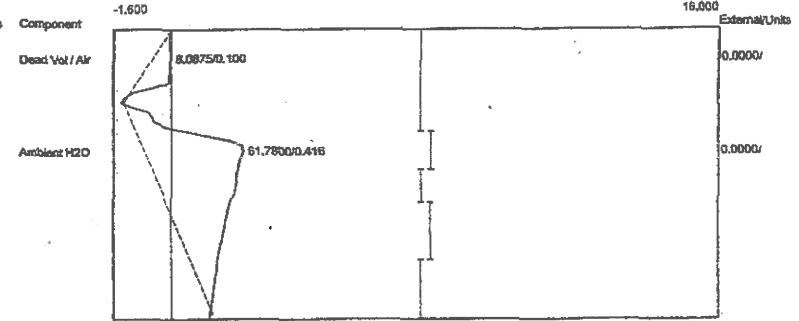
Area/ht.	Amount	CF	Current	Previous #1	Previous #2
0.000	0.000	0.000	0.000	N/A	N/A
1.390	1.100	1.264	1.390	N/A	N/A
13.100	10.100	1.297	13.100	N/A	N/A
123.000	100.000	1.230	123.000	N/A	N/A

Client: Sterigenics - Charlotte  
 Client ID: PreCal  
 Analysis date: 11/12/2015 11:06:22  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-Amb.CHR (c:\peak359)  
 Sample: Ambient Background  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: PreCal  
 Analysis date: 11/12/2015 11:06:22  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-Amb.CHR (c:\peak359)  
 Sample: Ambient Background  
 Operator: D. Kremer



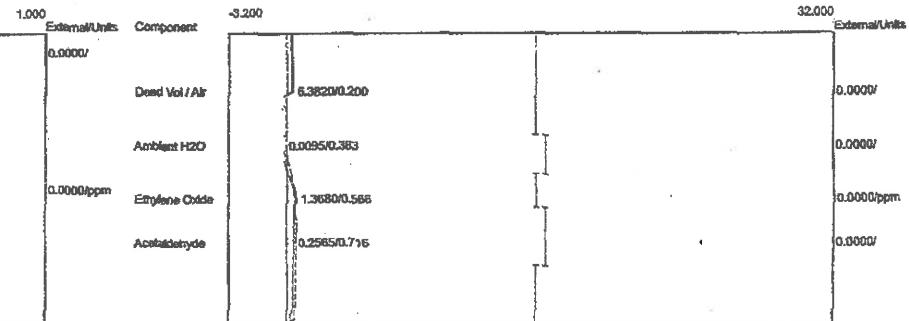
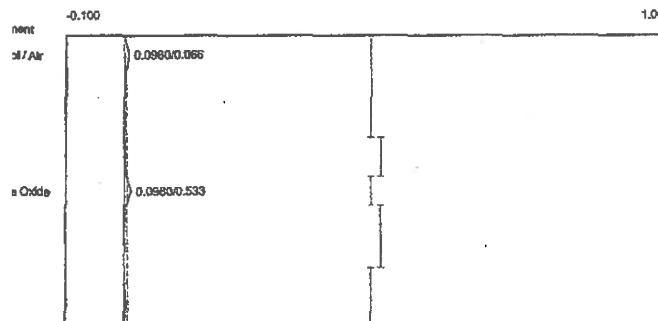
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9570	0.0000	
Ambient H2O	0.366	0.0850	0.0000	
		1.0420	0.0000	



Component	Retention	Area	External	Units
Dead Vol / Air	0.100	8.0875	0.0000	
Ambient H2O	0.416	61.7800	0.0000	
		69.8675	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:17:18  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-Cal01.CHR (c:\peak359)  
 Sample: 1.10 ppm EtO std  
 Operator: D. Kremer

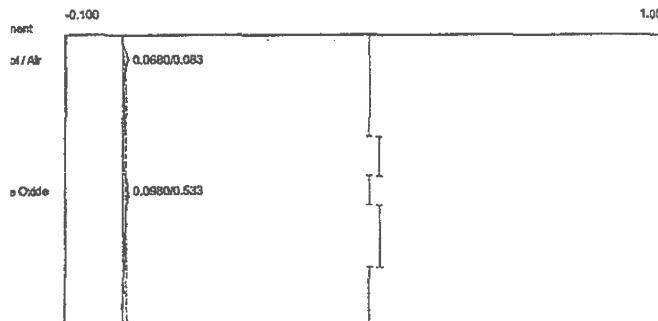
Client: Sterigenics - Charlotte  
 Client ID: PreCal 1  
 Analysis date: 11/13/2015 04:17:18  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-Cal01.CHR (c:\peak359)  
 Sample: 1.10 ppm EtO std  
 Operator: D. Kremer



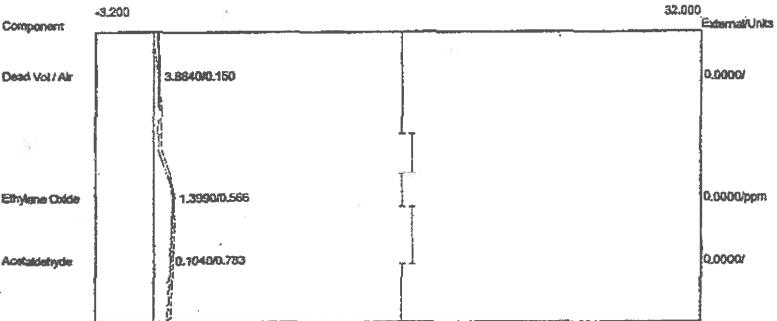
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	0.0960	0.0000	
Ethylene Oxide	0.533	0.0980	0.0000 ppm	
		0.1940	0.0000	

Component	Retention	Area	External	Units
Dead Vol / Air	0.200	6.3820	0.0000	
Ambient H2O	0.383	0.0095	0.0000	
Ethylene Oxide	0.566	1.3680	0.0000 ppm	
Acetaldehyde	0.716	0.2565	0.0000	
		8.0160	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:20:17  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-Cal02.CHR (c:\peak359)  
 Sample: 1.10 ppm EtO std  
 Operator: D. Kremer



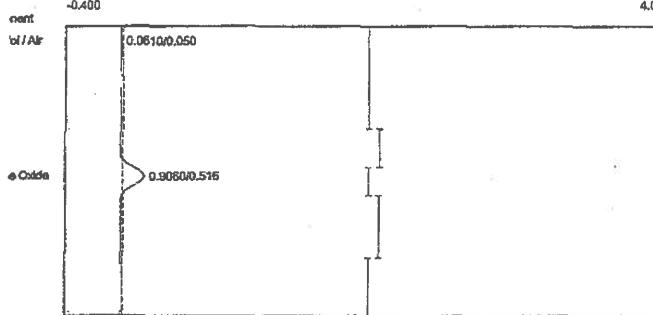
Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:20:17  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-Cal02.CHR (c:\peak359)  
 Sample: 1.10 ppm EtO std  
 Operator: D. Kremer



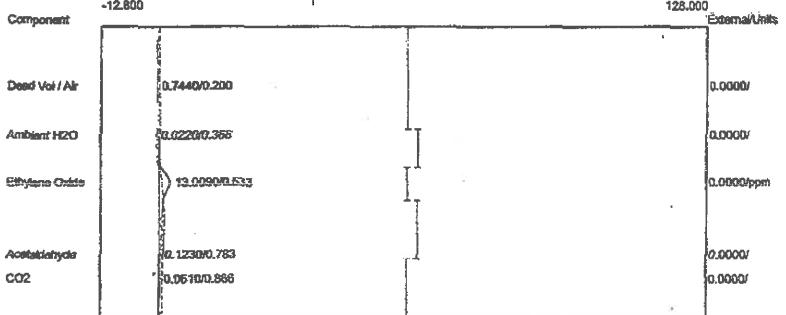
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	0.0680	0.0000	
Ethylene Oxide	0.533	0.0980	0.0000	ppm
		0.1660	0.0000	

Component	Retention	Area	External	Units
Dead Vol / Air	0.150	3.8840	0.0000	
Ethylene Oxide	0.566	1.3990	0.0000	ppm
Acetaldehyde	0.783	0.1040	0.0000	
		5.3870	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:24:29  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-CaI03.CHR (c:\peak359)  
 Sample: 10.1 ppm EtO std  
 Operator: D. Kremer



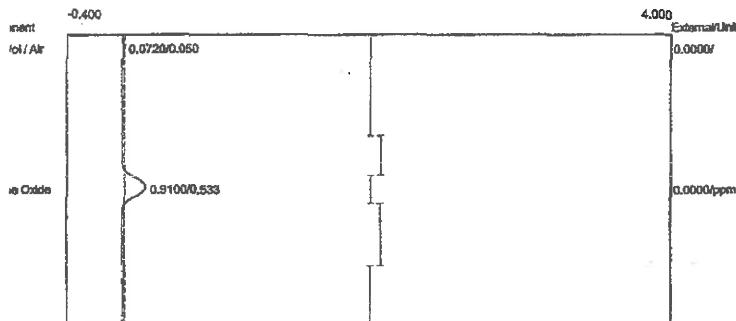
Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:24:29  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-CaI03.CHR (c:\peak359)  
 Sample: 10.1 ppm EtO std  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.050	0.0610	0.0000	
Ethylene Oxide	0.516	0.9060	0.0000	ppm
	0.9670	0.0000		

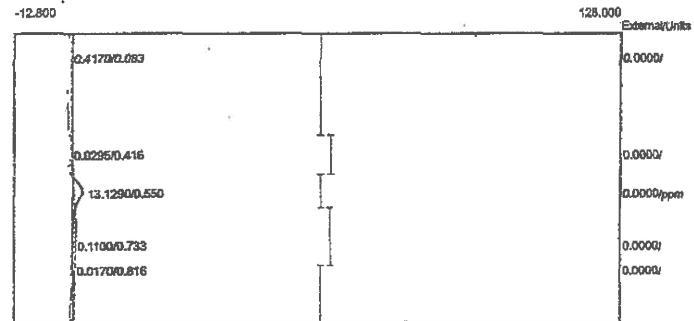
Component	Retention	Area	External	Units
Dead Vol / Air	0.200	0.7440	0.0000	
Ambient H <sub>2</sub> O	0.366	0.0220	0.0000	
Ethylene Oxide	0.533	13.0090	0.0000	ppm
Acetaldehyde	0.783	0.1230	0.0000	
CO <sub>2</sub>	0.866	0.0610	0.0000	
		13.9590	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: PreCal 1  
 analysis date: 11/13/2015 04:25:48  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-Cal04.CHR (c:\peak359)  
 Sample: 10.1 ppm EtO std  
 Operator: D. Kremer



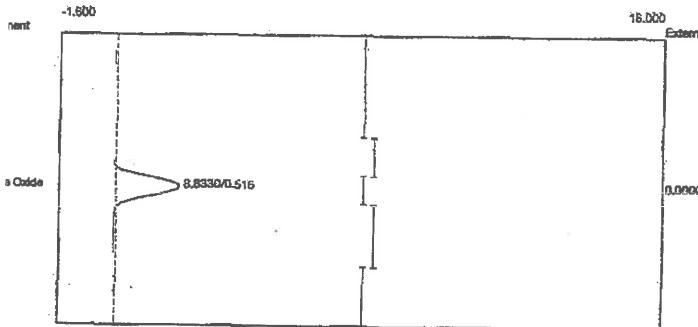
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	0.0720	0.0000	
Ethylene Oxide	0.533	0.9100	0.0000	ppm
		0.9820	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:25:48  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-Cal04.CHR (c:\peak359)  
 Sample: 10.1 ppm EtO std  
 Operator: D. Kremer

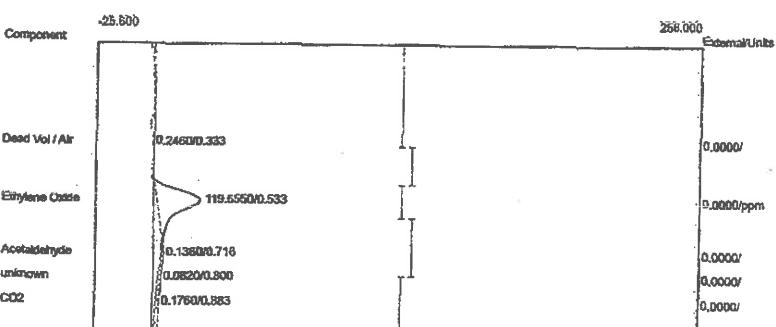


Component	Retention	Area	External	Units
Dead Vol / Air	0.083	0.4170	0.0000	
Ambient H2O	0.416	0.0295	0.0000	
Ethylene Oxide	0.550	13.1290	0.0000	ppm
Acetaldehyde	0.733	0.1100	0.0000	
CO2	0.816	0.0170	0.0000	
		13.7025	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:29:19  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-Cal05.CHR (c:\peak359)  
 Sample: 100 ppm EtO std  
 Operator: D. Kremer



Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:29:19  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-Cal05.CHR (c:\peak359)  
 Sample: 100 ppm EtO std  
 Operator: D. Kremer

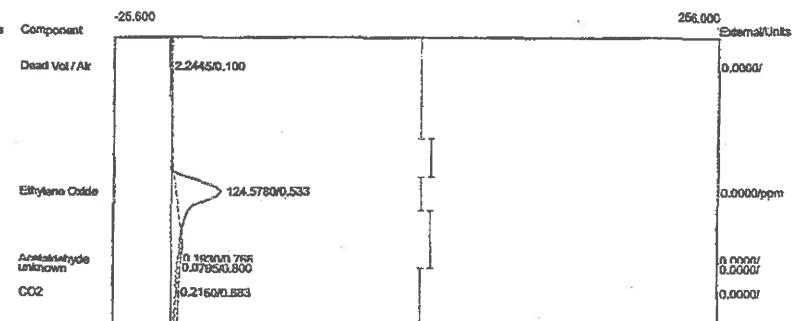
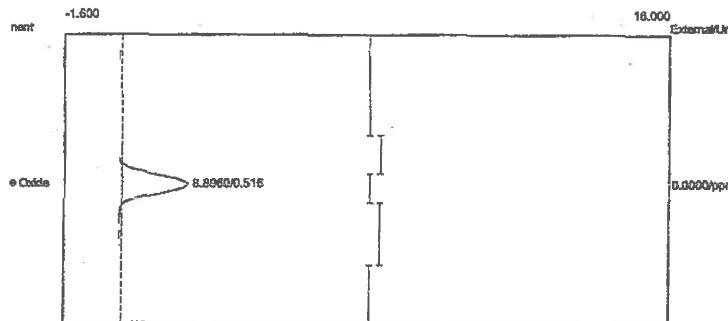


Component	Retention	Area	External	Units
Ethylene Oxide	0.516	8.8330	0.0000	ppm
		8.8330	0.0000	

Component	Retention	Area	External	Units
Dead Vol / Air	0.333	0.2460	0.0000	
Ethylene Oxide	0.533	119.6550	0.0000	ppm
Acetaldehyde	0.716	0.1360	0.0000	
CO2	0.883	0.1760	0.0000	
		120.2130	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: PreCat 7  
 Analysis date: 11/13/2015 04:32:30  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-Cal06.CHR (c:\peak359)  
 Sample: 100 ppm EtO std  
 Operator: D. Kremer

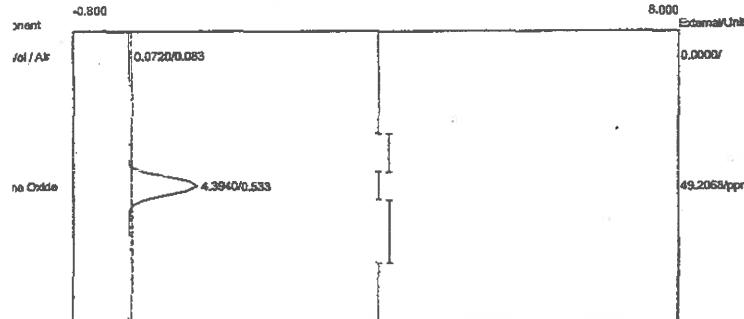
Client: Sterigenics - Charlotte  
 Client ID: PreCat 7  
 Analysis date: 11/13/2015 04:32:30  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-Cal06.CHR (c:\peak359)  
 Sample: 100 ppm EtO std  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Ethylene Oxide	0.516	8.8960	0.0000	ppm
		8.8960	0.0000	

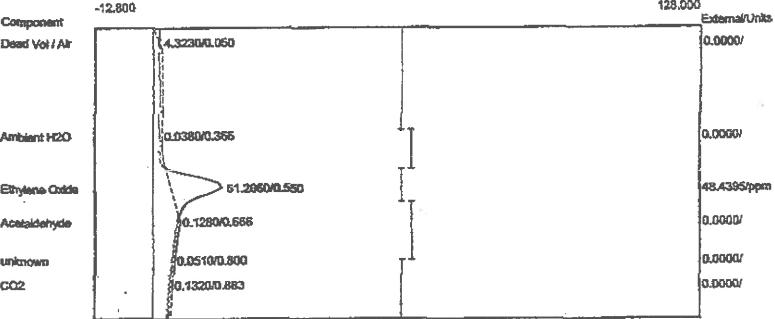
Component	Retention	Area	External	Units
Dead Vol / Air	0.100	2.2445	0.0000	
Ethylene Oxide	0.533	124.5780	0.0000	ppm
Acetaldehyde	0.766	0.1930	0.0000	
CO2	0.883	0.2160	0.0000	
		127.2315	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:47:32  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-Cal07.CHR (c:\peak359)  
 Sample: 48.8 ppm EtO std  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.083	0.0720	0.0000	
Ethylene Oxide	0.533	4.3940	49.2068	ppm
		4.4660	49.2068	

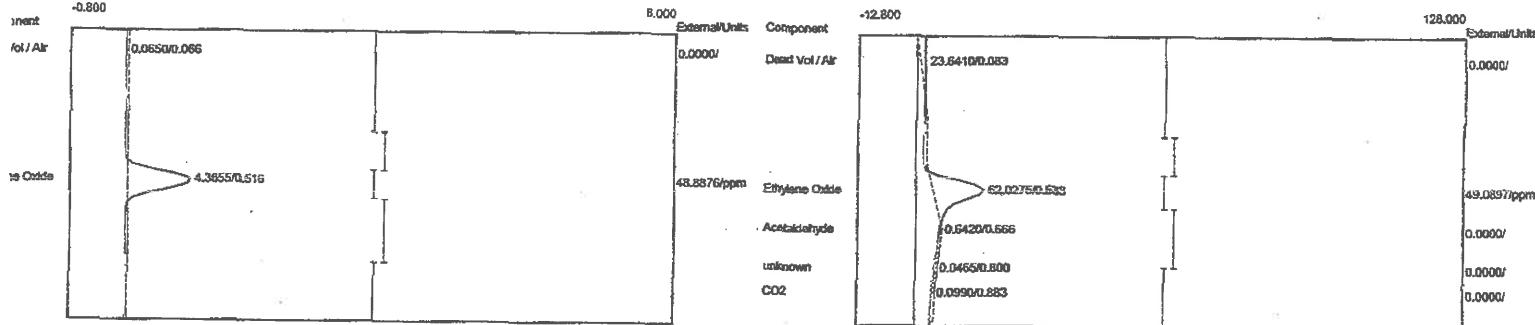
Client: Sterigenics - Charlotte  
 Client ID: PreCal 7  
 Analysis date: 11/13/2015 04:47:32  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-Cal07.CHR (c:\peak359)  
 Sample: 48.8 ppm EtO std  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.050	4.3230	0.0000	
Ambient H2O	0.366	0.0380	0.0000	
Ethylene Oxide	0.550	61.2060	48.4395	ppm
Acetaldehyde	0.666	0.1280	0.0000	
CO2	0.883	0.1320	0.0000	
		65.8270	48.4395	

Client: Sterigenics - Charlotte  
 Client ID: PostCal 3  
 Analysis date: 11/13/2015 12:35:22  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-Cal08.CHR (c:\peak359)  
 Sample: 48.8 ppm EtO std  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: PostCal 7  
 Analysis date: 11/13/2015 12:35:22  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-Cal08.CHR (c:\peak359)  
 Sample: 48.8 ppm EtO std  
 Operator: D. Kremer



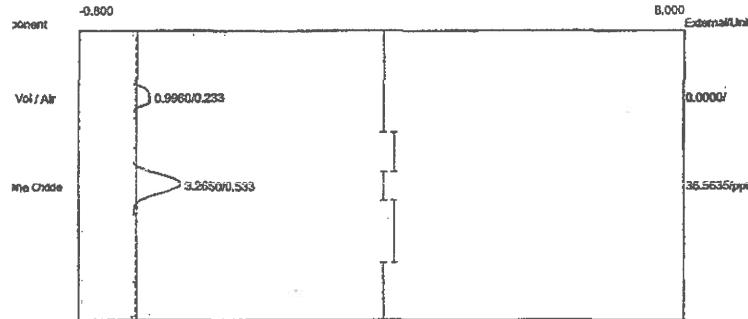
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	0.0650	0.0000	
Ethylene Oxide	0.516	4.3655	48.8876 ppm	
		4.4305	48.8876	

Component	Retention	Area	External	Units
Dead Vol / Air	0.083	23.6410	0.0000	
Ethylene Oxide	0.533	62.0275	49.0897 ppm	
Acetaldehyde	0.666	0.6420	0.0000	
CO2	0.883	0.0990	0.0000	
		86.4095	49.0897	

## **APPENDIX B**

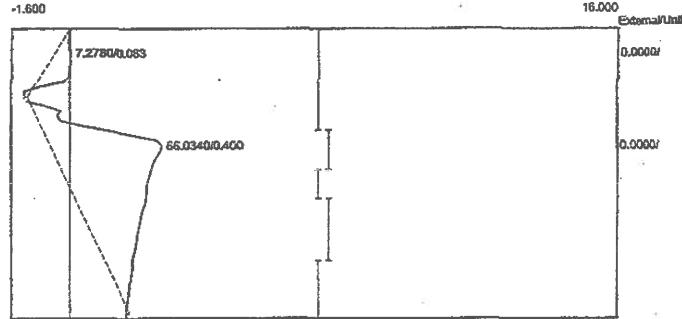
### **Run #1 Chromatograms – Backvent**

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:17:35  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B01.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
ad Vol / Air	0.233	0.9960	0.0000	
Tylenic Oxide	0.533	3.2650	36.5635 ppm	
	4.2610	36.5635		

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:17:35  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B01.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.083	7.2780	0.0000	
Ambient H2O	0.400	66.0340	0.0000	
	73.3120	0.0000		

Client: Sterigenics - Charlotte

Client ID: Run#1BV

Analysis date: 11/13/2015 10:18:40

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carboback B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-1B02.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#1BV

Analysis date: 11/13/2015 10:18:40

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carboback B

Carrier: HELIUM

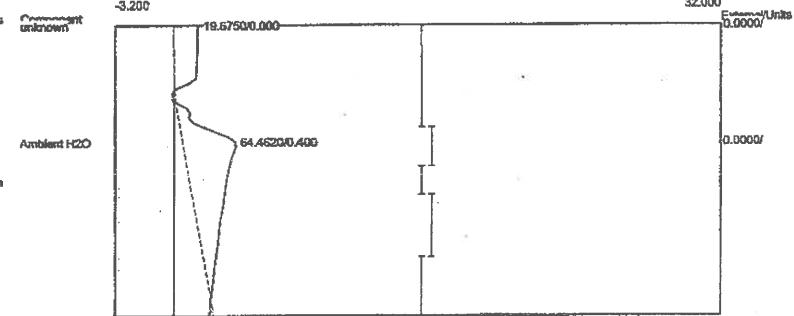
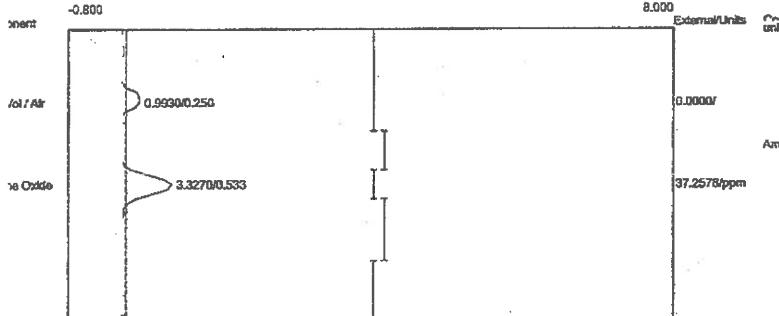
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-1B02.CHR (c:\peak359)

Sample: Oxidizer Outlet

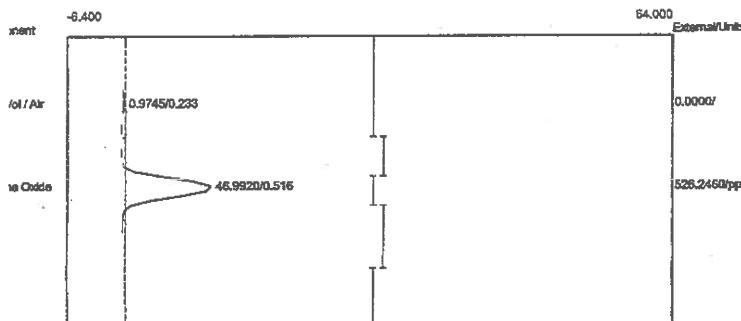
Operator: D. Kremer



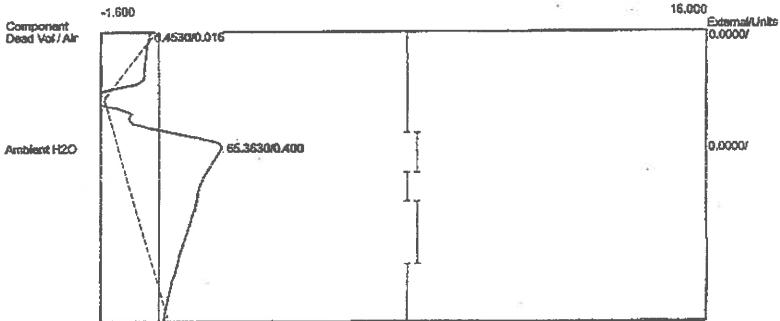
Component	Retention	Area	External	Units
Vol / Air	0.250	0.9930	0.0000	
Ethylene Oxide	0.533	3.3270	37.2578 ppm	
	4.3200	37.2578		

Component	Retention	Area	External	Units
Ambient H <sub>2</sub> O	0.400	64.4620	0.0000	
		64.4620	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 alysis date: 11/13/2015 10:19:49  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B03.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



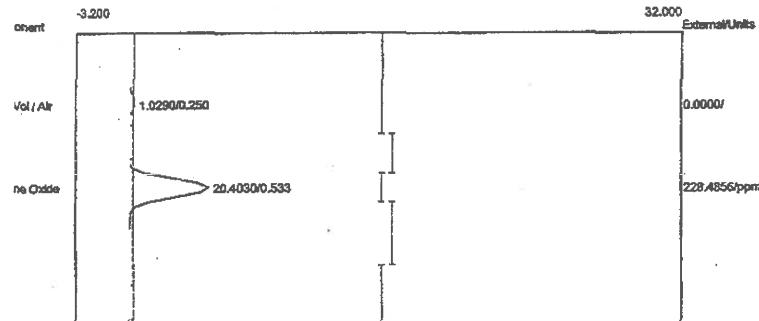
Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:19:49  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B03.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



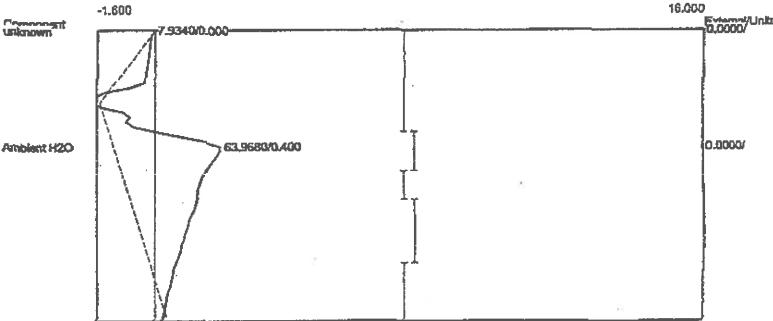
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9745	0.0000	
Ethylene Oxide	0.516	46.9920	526.2460	ppm
		47.9665	526.2460	

Component	Retention	Area	External	Units
Dead Vol / Air	6.4530	0.016	0.4530	0.0000
Ambient H2O	65.3630	0.400	65.3630	0.0000
		71.8160	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:20:58  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B04.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



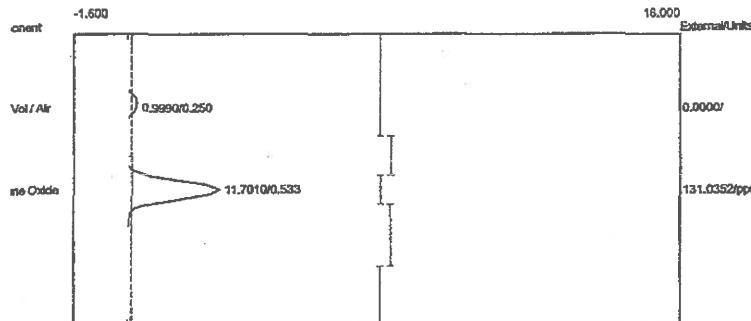
Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:20:58  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B04.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.250	1.0290	0.0000	
Ethylene Oxide	0.533	20.4030	228.4856 ppm	

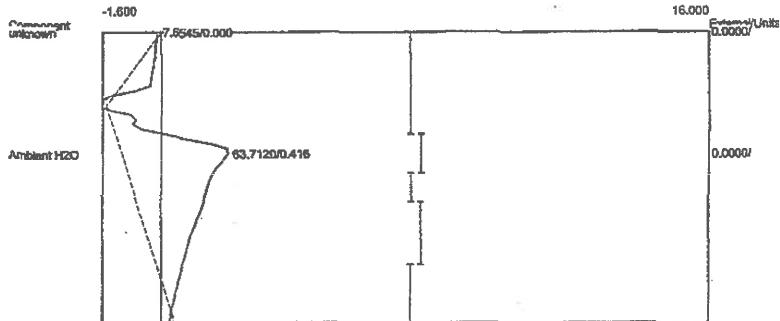
Component	Retention	Area	External	Units
Ambient H2O	0.400	63.9680	0.0000	
Unknown		7.9340/0.000		
		63.9680/0.400		
		0.0000/		

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:22:10  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B05.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
ad Vol / Air	0.250	0.9990	0.0000	
Ethylene Oxide	0.533	11.7010	131.0352	ppm
	12.7000	131.0352		

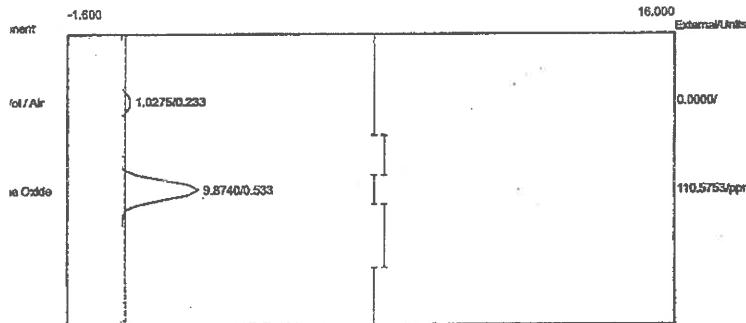
Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:22:10  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B05.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



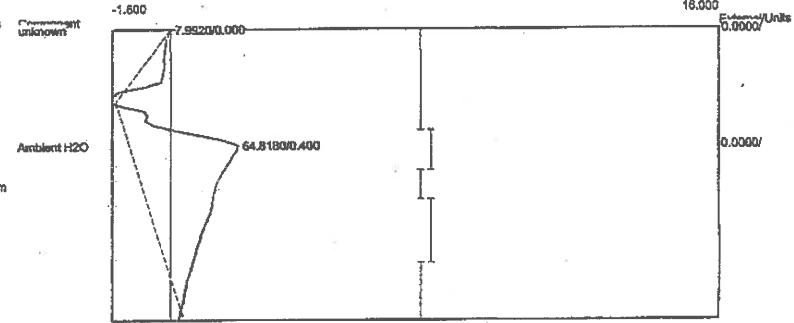
Component	Retention	Area	External	Units
Ambient H2O	0.416	63.7120	0.0000	
	63.7120	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 alysis date: 11/13/2015 10:23:20  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B06.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:23:20  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B06.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

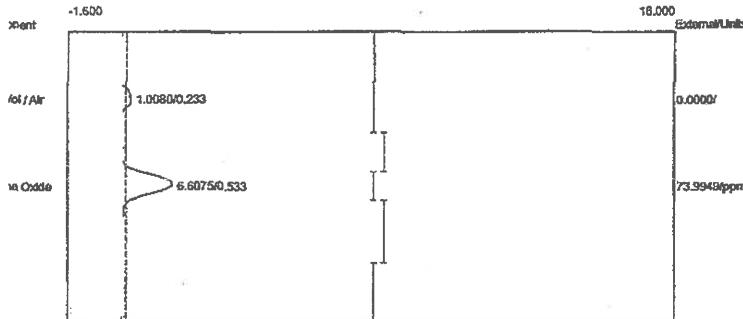


Component	Retention	Area	External	Units
Vol / Air	0.233	1.0275	0.0000	
Ethylene Oxide	0.533	9.8740	110.5753	ppm
		10.9015	110.5753	



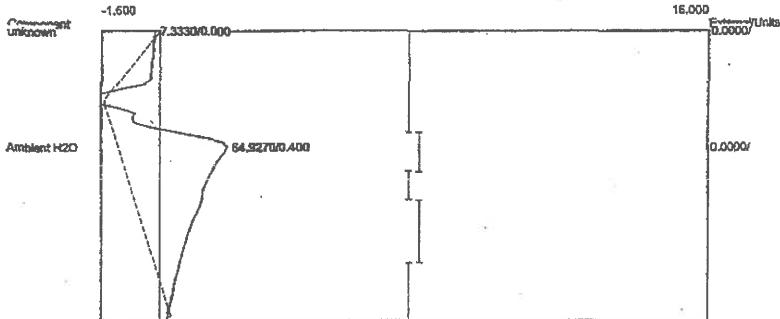
Component	Retention	Area	External	Units
Ambient H2O	0.400	64.8180	0.0000	
		64.8180	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 alysis date: 11/13/2015 10:24:34  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carboback B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B07.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



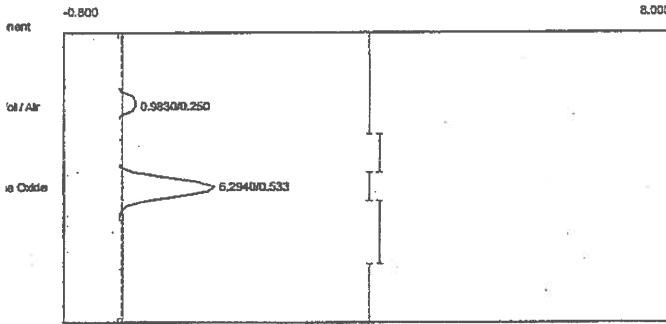
Component	Retention	Area	External	Units
Vol / Air	0.233	1.0080	0.0000	
Ethylene Oxide	0.533	6.6075	73.9949	ppm
	7.6155	73.9949		

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:24:34  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carboback B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B07.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



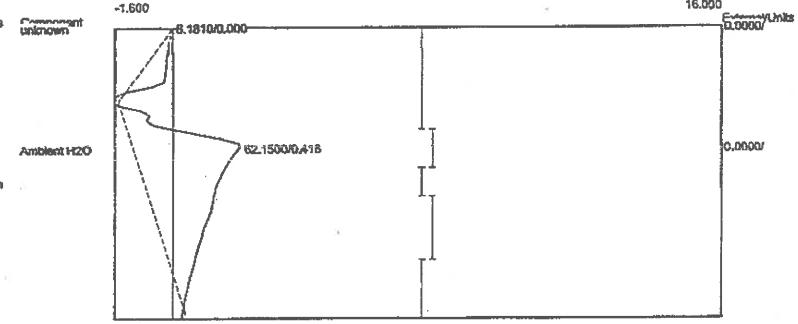
Component	Retention	Area	External	Units
Ambient H2O	0.400	64.9270	0.0000	
	64.9270	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 analysis date: 11/13/2015 10:25:45  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B08.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.250	0.9830	0.0000	
ethylene Oxide	0.533	6.2940	70.4842	ppm
	7.2770	70.4842		

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:25:45  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B08.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Ambient H2O	0.416	8.1810	0.0000	
		62.1500	0.0000	

Client: Sterigenics - Charlotte

Client ID: Run#1BV

alysis date: 11/13/2015 10:26:57

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carboback B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-1B09.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#1BV

Analysis date: 11/13/2015 10:26:57

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carboback B

Carrier: HELIUM

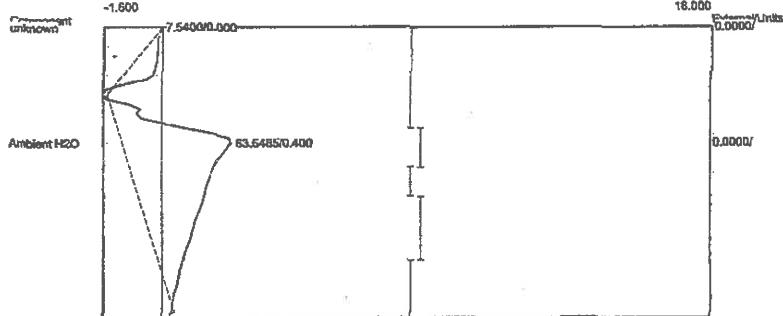
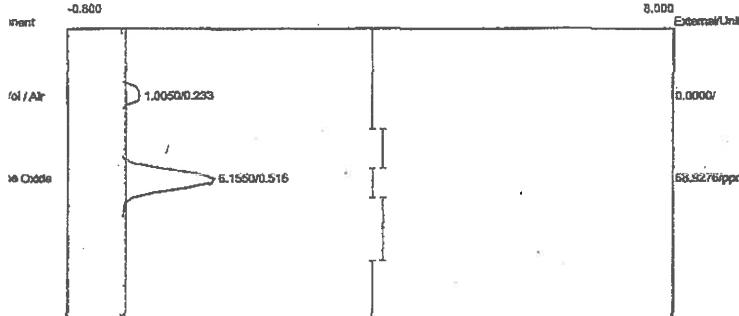
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-1B09.CHR (c:\peak359)

Sample: Oxidizer Outlet

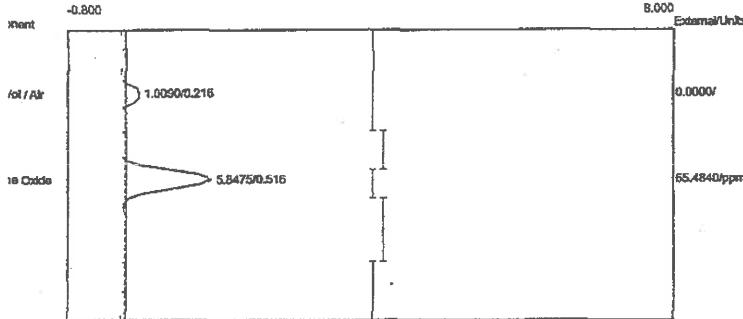
Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	1.0050	0.0000	
Ethylene Oxide	0.516	6.1550	68.9276 ppm	
		7.1600	68.9276	

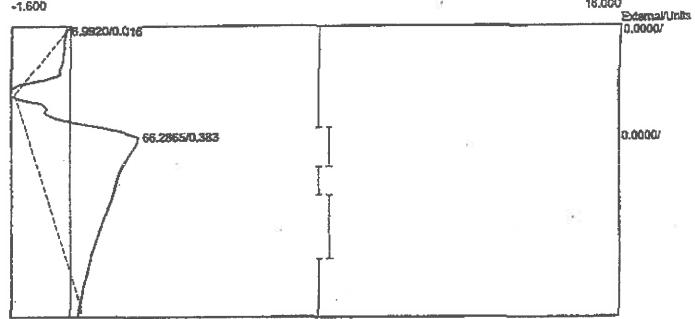
Component	Retention	Area	External	Units
Ambient H2O	0.400	63.6485	0.0000	
		63.6485	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 alysis date: 11/13/2015 10:28:12  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B10.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	1.0090	0.0000	
Ethylene Oxide	0.516	5.8475	65.4840	ppm
	6.8565	65.4840		

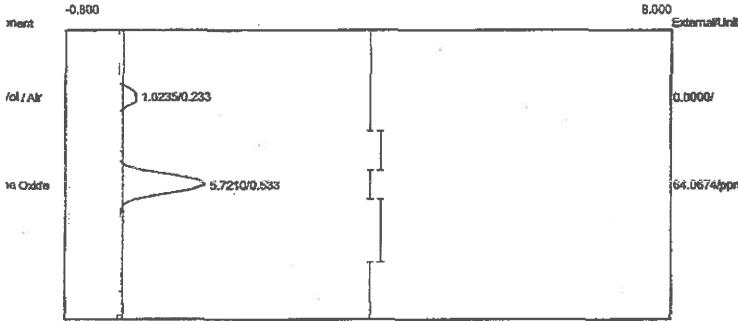
Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:28:12  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B10.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



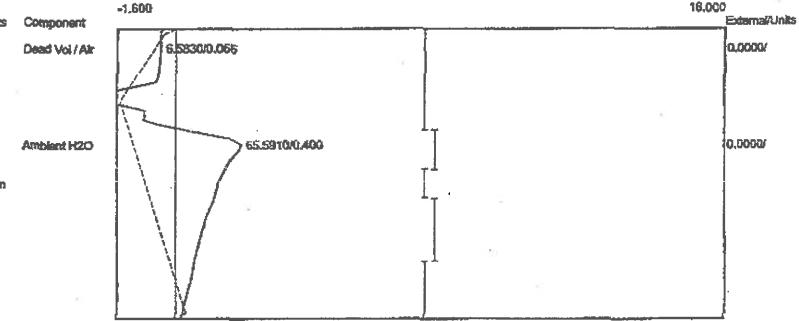
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	6.9920	0.0000	
Ambient H2O	0.383	66.2865	0.0000	
	73.2785	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:29:42  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1B11.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#1BV  
 Analysis date: 11/13/2015 10:29:42  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1B11.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	1.0235	0.0000	
Ethylene Oxide	0.533	5.7210	64.0674 ppm	
	6.7445	64.0674		

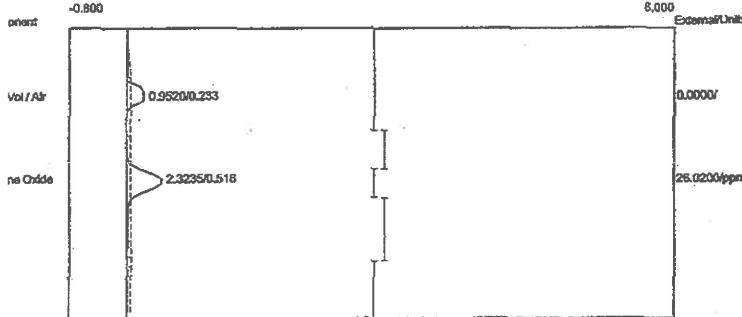


Component	Retention	Area	External	Units
Dead Vol / Air	0.066	6.5830	0.0000	
Ambient H2O	0.400	65.5910	0.0000	
	72.1740	0.0000		

## **APPENDIX C**

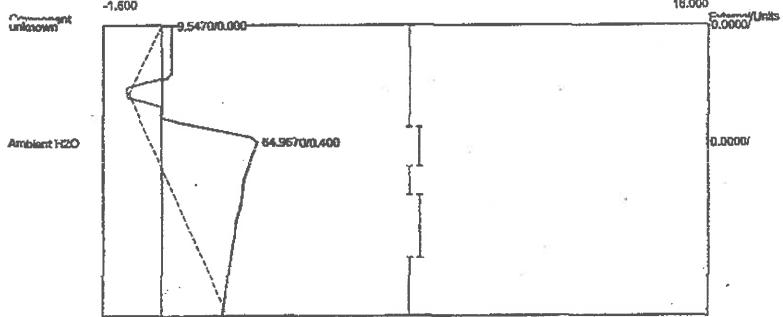
### **Run #1 Chromatograms – Aeration**

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 08:48:27  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A01.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



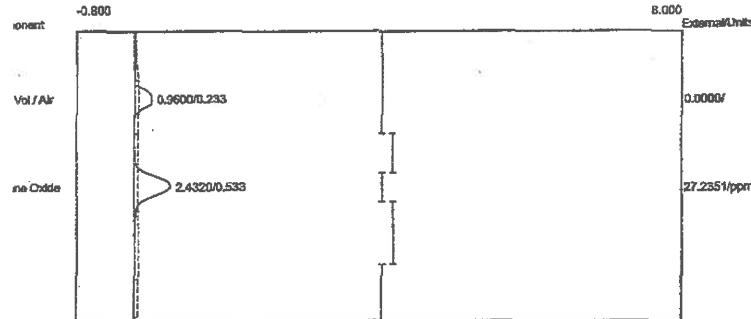
Component	Retention	Area	External	Units
ad Vol / Air	0.233	0.9520	0.0000	
Ethylene Oxide	0.516	2.3235	26.0200	ppm
	3.2755	3.2755	26.0200	

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 08:48:27  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A01.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



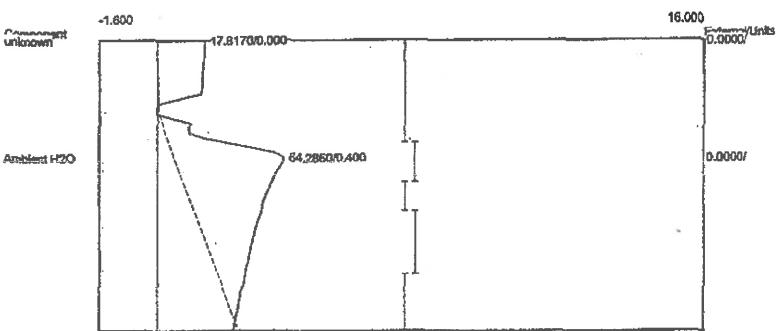
Component	Retention	Area	External	Units
Ambient H2O	0.400	64.9670	0.0000	
	64.9670	64.9670	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 08:53:51  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A02.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



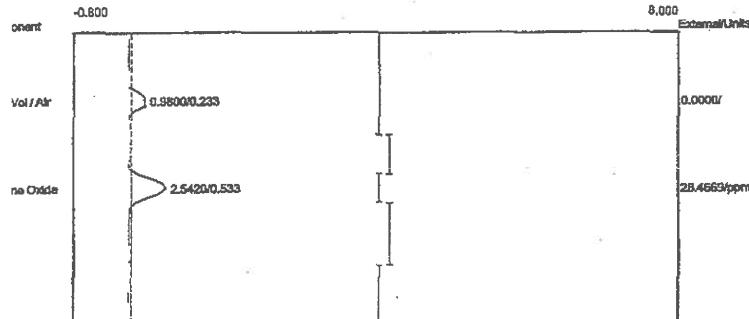
Component	Retention	Area	External	Units
Vad Vol / Air	0.233	0.9600	0.0000	
Ethylene Oxide	0.533	2.4320	27.2351 ppm	
	3.3920	27.2351		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 08:53:51  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A02.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



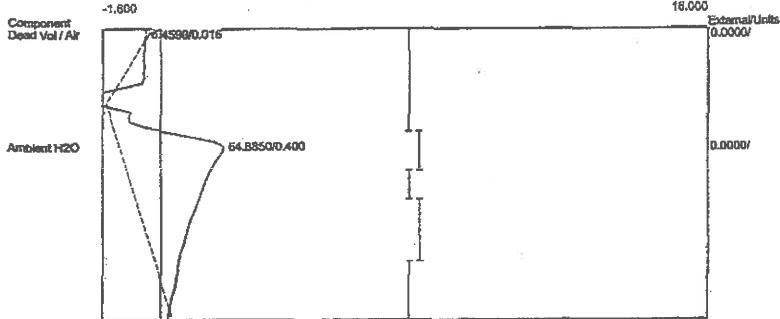
Component	Retention	Area	External	Units
Ambient H2O	0.400	64.2860	0.0000	
	64.2860	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 08:58:13  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tern  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A03.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



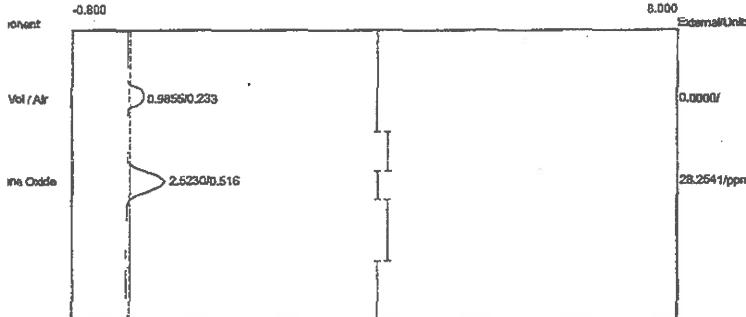
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9800	0.0000	
Ethylene Oxide	0.533	2.5420	28.4669	ppm
	3.5220	3.5220	28.4669	

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 08:58:13  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tern  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A03.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



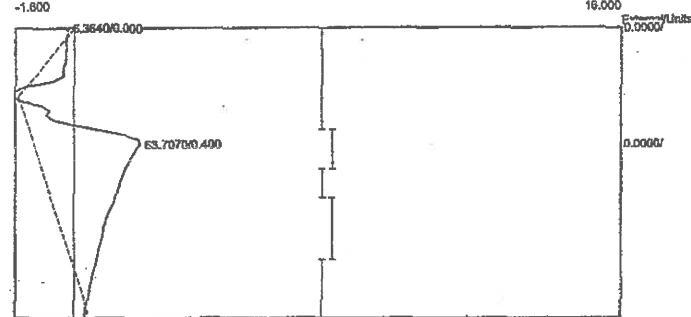
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	0.016	0.0000	
Ambient H2O	0.400	64.8850	0.0000	
	71.3440	71.3440	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:03:25  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A04.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



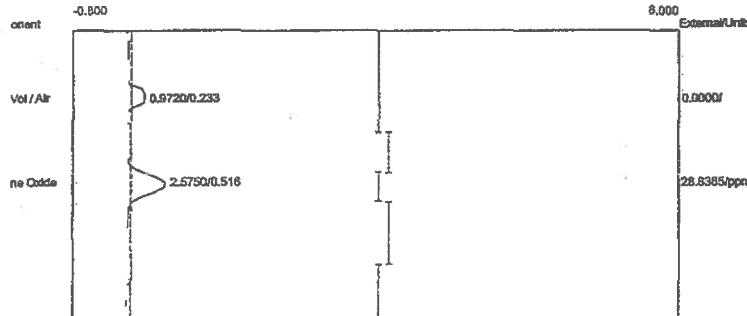
Component	Retention	Area	External	Units
ad Vol / Air	0.233	0.9855	0.0000	
Ethylene Oxide	0.516	2.5230	28.2541	ppm
	3.5085	28.2541		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:03:25  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A04.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



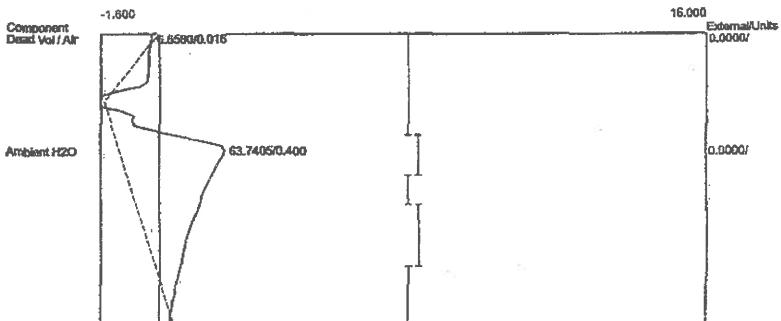
Component	Retention	Area	External	Units
Ambient H2O	0.400	63.7070	0.0000	
	63.7070	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:08:03  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A05.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



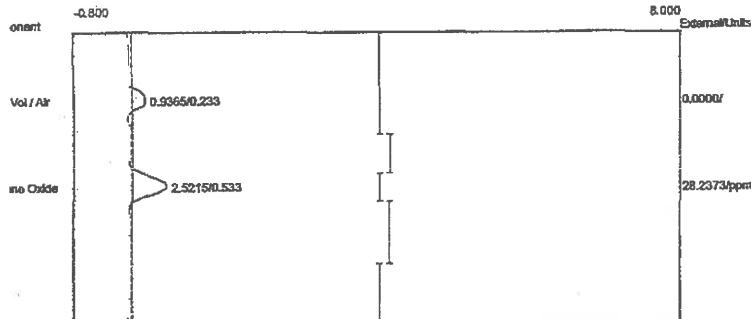
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9720	0.0000	
Ethylene Oxide	0.516	2.5750	28.8365	ppm
	3.5470	28.8365		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:08:03  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A05.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

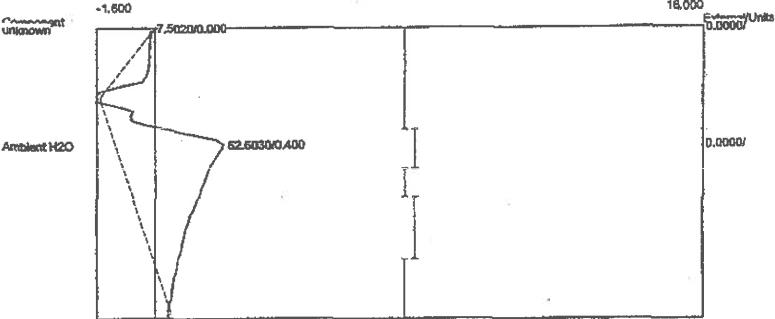


Component	Retention	Area	External	Units
Dead Vol / Air	0.016	6.6580	0.0000	
Ambient H2O	0.400	63.7405	0.0000	
	70.3985	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:13:20  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A06.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



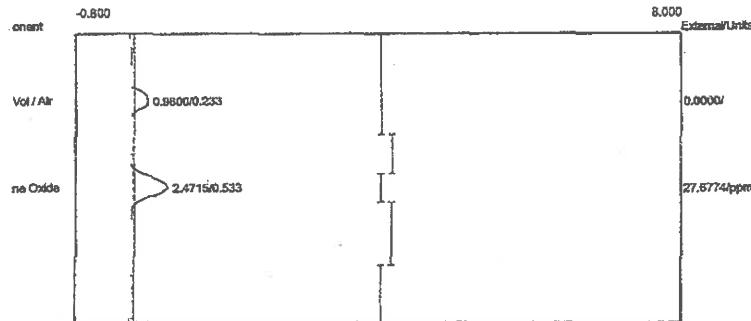
Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:13:20  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A06.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
ad Vol / Air	0.233	0.9365	0.0000	
Ethylene Oxide	0.533	2.5215	28.2373	ppm
	3.4580	28.2373		

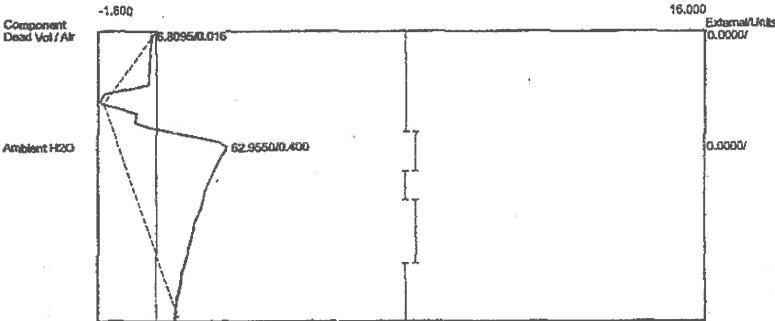
Component	Retention	Area	External	Units
Ambient H2O	0.400	62.6030	0.0000	
	62.6030	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:18:06  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A07.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



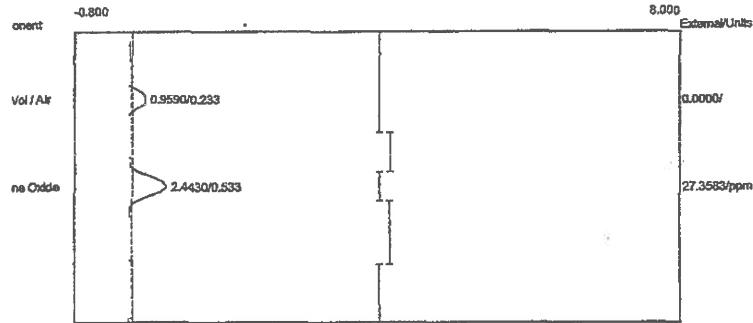
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9800	0.0000	
Ethylene Oxide	0.533	2.4715	27.6774	ppm
	3.4515	27.6774		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:18:06  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A07.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



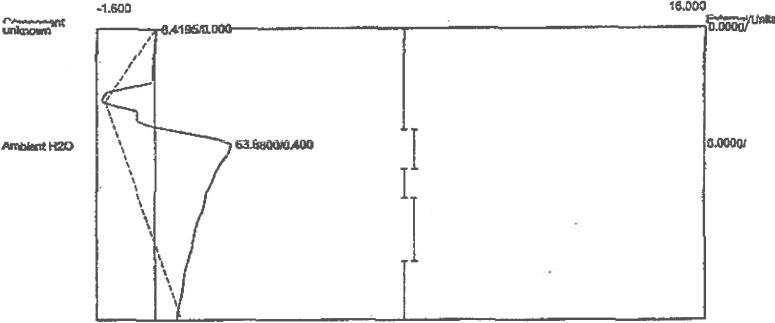
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	6.8095	0.0000	
Ambient H2O	0.400	62.9550	0.0000	
	69.7645	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:23:30  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A08.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Ethylene Oxide	0.233	0.9590	0.0000	
	0.533	2.4430	27.3583	ppm
	3.4020	27.3583		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:23:30  
 Method: Direct injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A08.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Ambient H2O	0.400	63.8800	0.0000	
	63.8800	63.8800	0.0000	

Client: Sterigenics - Charlotte

Client ID: Run#1Aer

Analysis date: 11/13/2015 09:28:17

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-1A09.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#1Aer

Analysis date: 11/13/2015 09:28:17

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

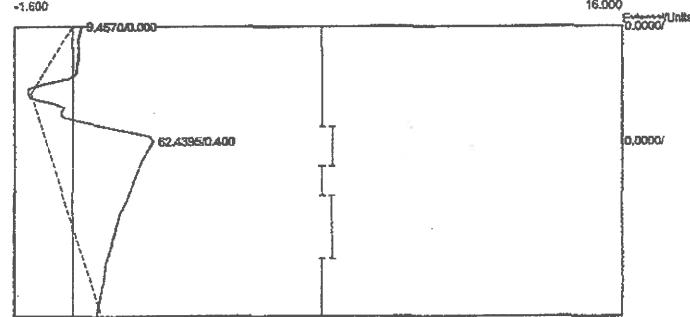
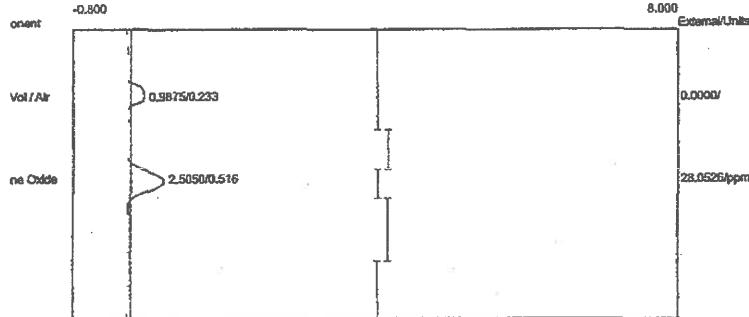
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-1A09.CHR (c:\peak359)

Sample: Oxidizer Outlet

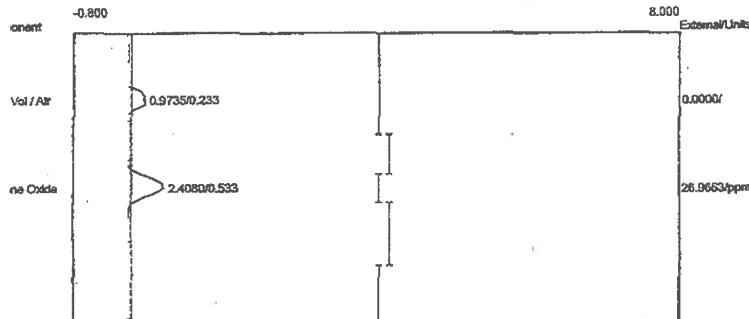
Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	0.9875	0.0000	
Ethylene Oxide	0.516	2.5050	28.0526	ppm
	3.4925	28.0526		

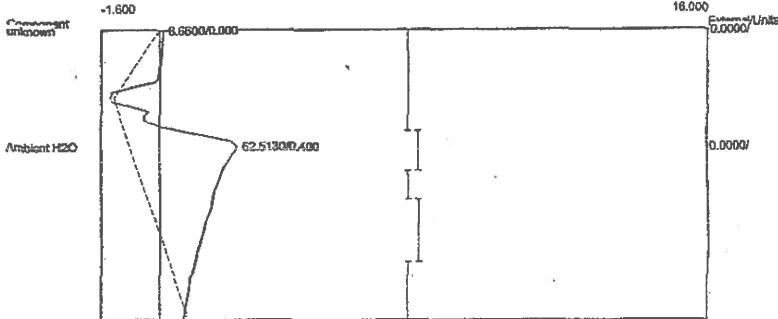
Component	Retention	Area	External	Units
Ambient H2O	0.400	62.4395	0.0000	
	62.4395	0.400	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:33:02  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A10.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



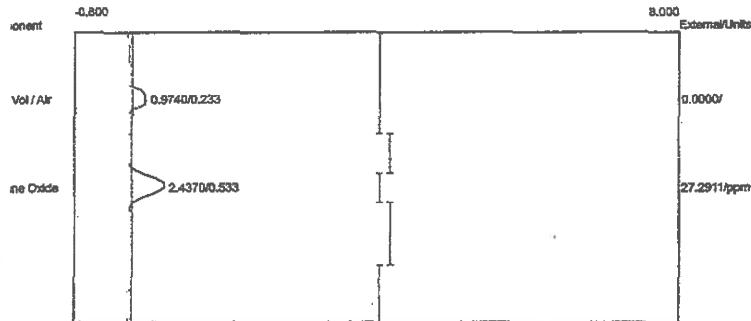
Component	Retention	Area	External	Units
Ethylene Oxide	0.233	0.9735	0.0000	
	0.533	2.4080	26.9663	ppm
	3.3815	26.9663		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:33:02  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A10.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



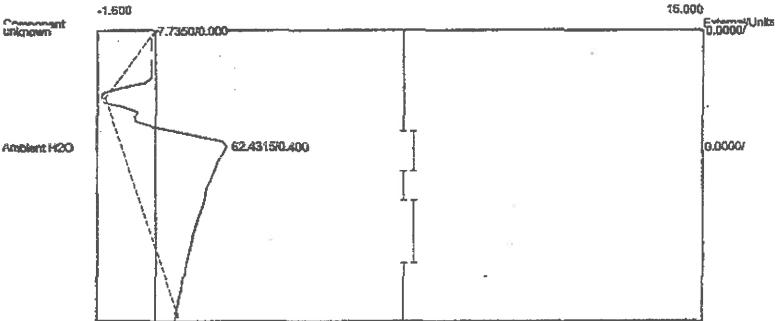
Component	Retention	Area	External	Units
Ambient H2O	0.400	62.5130	0.0000	
	62.5130	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:38:16  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A11.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



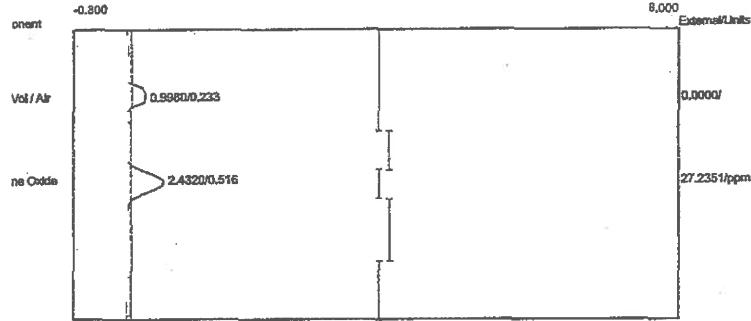
Component	Retention	Area	External	Units
ad Vol / Air	0.233	0.9740	0.0000	
Ethylene Oxide	0.533	2.4370	27.2911	ppm
	3.4110	27.2911		

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:38:16  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A11.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



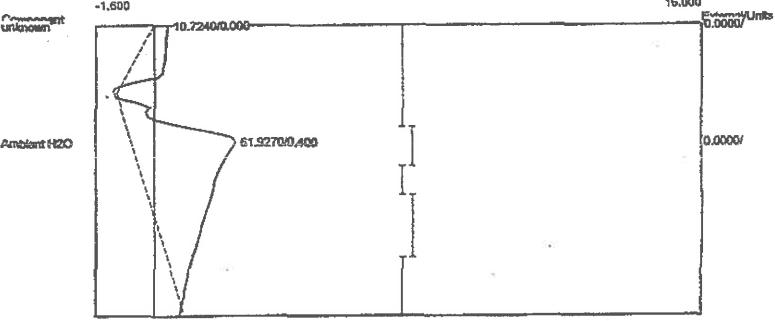
Component	Retention	Area	External	Units
Ambient H2O	0.400	62.4315	0.0000	
	62.4315	62.4315	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:43:06  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-1A12.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	0.9980	0.0000	
ethylene Oxide	0.516	2.4320	27.2351	ppm
	3.4300	27.2351		

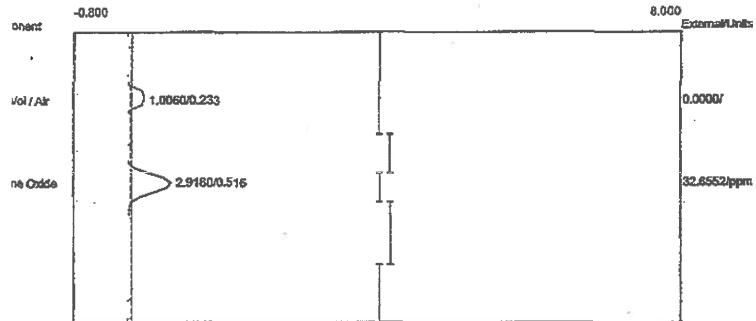
Client: Sterigenics - Charlotte  
 Client ID: Run#1Aer  
 Analysis date: 11/13/2015 09:43:06  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-1A12.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Ambient H2O	0.400	61.9270	0.0000	
	61.9270	61.9270	0.0000	

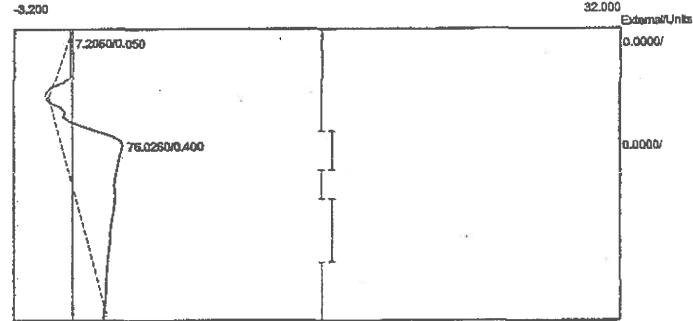
**APPENDIX D**  
**Run #2 Chromatograms – Backvent**

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:20:04  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B01.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



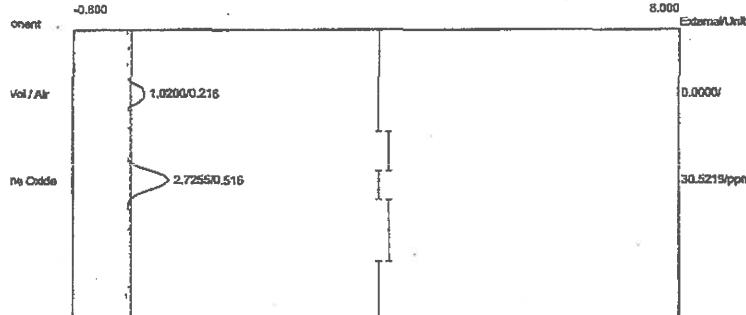
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	1.0060	0.0000	
Ethylene Oxide	0.516	2.9160	32.6552 ppm	
	3.9220	32.6552		

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:20:04  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B01.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



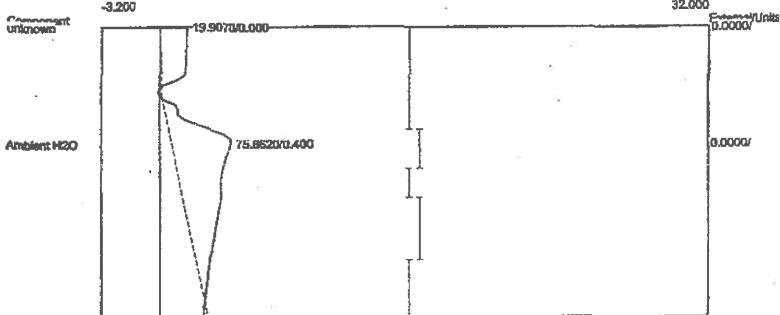
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	7.2060	0.0000	
Ambient H2O	0.400	76.0260	0.0000	
	83.2320	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:21:13  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B02.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



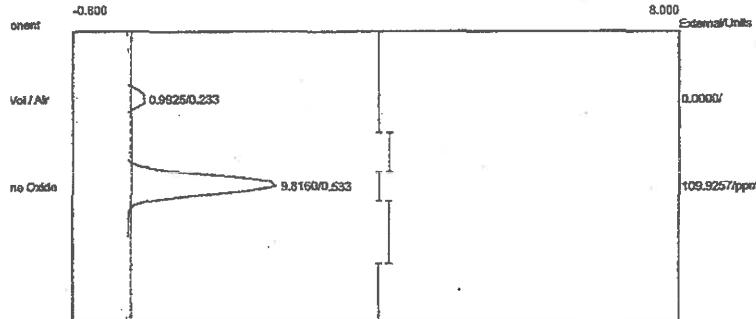
Component	Retention	Area	External	Units
Vol / Air	0.216	1.0200	0.0000	
Ethylene Oxide	0.516	2.7255	30.5219	ppm
	3.7455	30.5219		

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:21:13  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B02.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Ambient H2O	0.400	75.8620	0.0000	
	75.8620	0.0000		

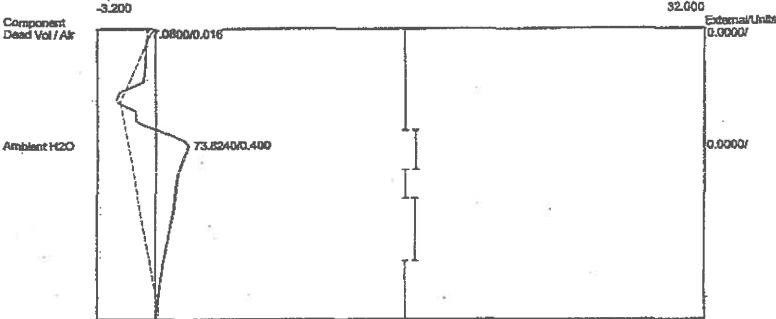
Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:22:21  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B03.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9925	0.0000	
Ethylene Oxide	0.533	9.8160	109.9257	ppm

10.8085 109.9257

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:22:21  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B03.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.0800	0.0000	
Ambient H2O	0.400	73.8240	0.0000	

80.9040 0.0000

Client: Sterigenics - Charlotte

Client ID: Run#2BV

Analysis date: 11/13/2015 12:23:27

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-2B04.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#2BV

Analysis date: 11/13/2015 12:23:27

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

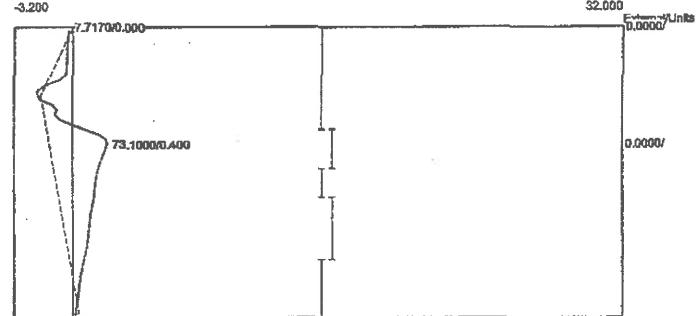
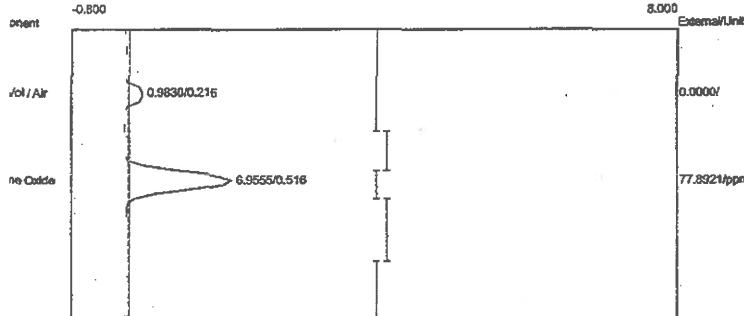
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-2B04.CHR (c:\peak359)

Sample: Oxidizer Outlet

Operator: D. Kremer

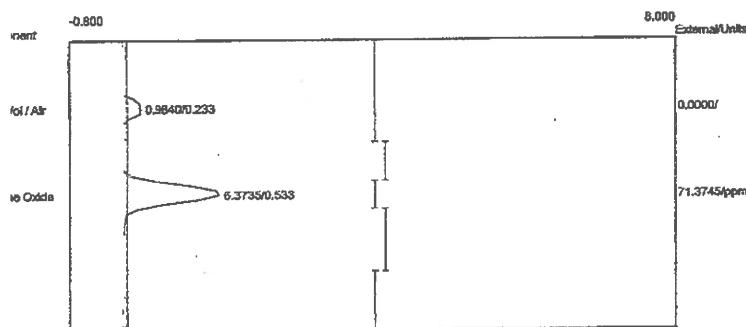


Component	Retention	Area	External	Units
ad Vol / Air	0.216	0.9830	0.0000	
Ethylene Oxide	0.516	6.9555	77.8921	ppm
	7.9385	77.8921		

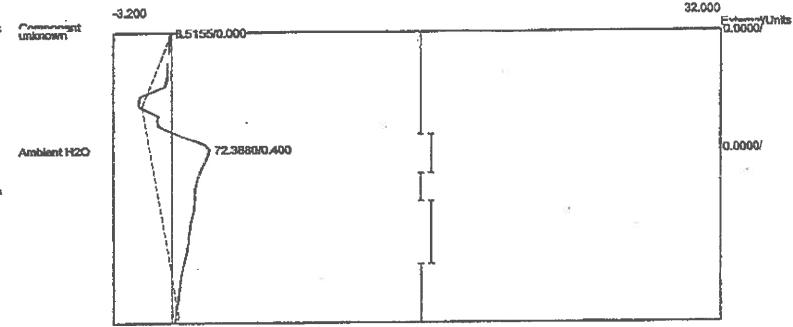
Component	Retention	Area	External	Units
Ambient H2O	0.400	73.1000	0.0000	
	73.1000	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 alysis date: 11/13/2015 12:24:34  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B05.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:24:34  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B05.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	0.9840	0.0000	
Ethylene Oxide	0.533	6.3735	71.3745	ppm
	7.3575	71.3745		



Component	Retention	Area	External	Units
Ambient H2O	0.400	72.3880	0.0000	
	72.3880	72.3880	0.0000	

Client: Sterigenics - Charlotte

Client ID: Run#2BV

Analysis date: 11/13/2015 12:25:42

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-2B06.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#2BV

Analysis date: 11/13/2015 12:25:42

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

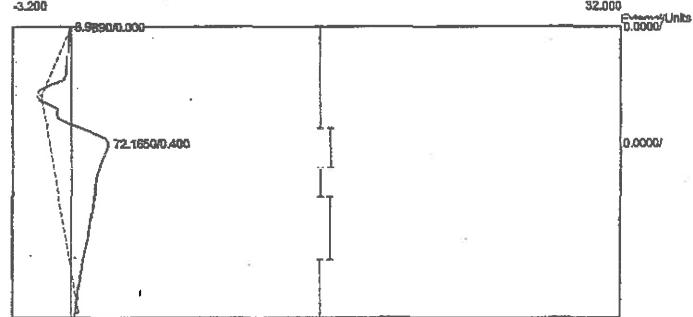
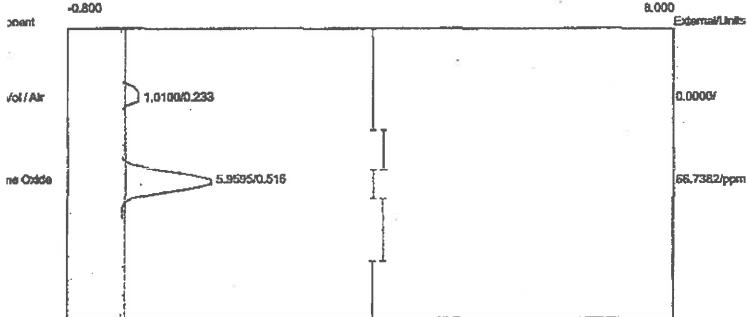
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-2B06.CHR (c:\peak359)

Sample: Oxidizer Outlet

Operator: D. Kremer



Component	Retention	Area	External	Units
ad Vol / Air	0.233	1.0100	0.0000	
ethylene Oxide	0.516	5.9595	66.7382 ppm	
	6.9695	66.7382		

Component	Retention	Area	External	Units
Ambient H2O	0.400	72.1650	0.0000	
	72.1650	72.1650	0.0000	

Client: Sterigenics - Charlotte

Client ID: Run#2BV

Analysis date: 11/13/2015 12:26:51

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, CarboPack B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-2B07.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#2BV

Analysis date: 11/13/2015 12:26:51

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, CarboPack B

Carrier: HELIUM

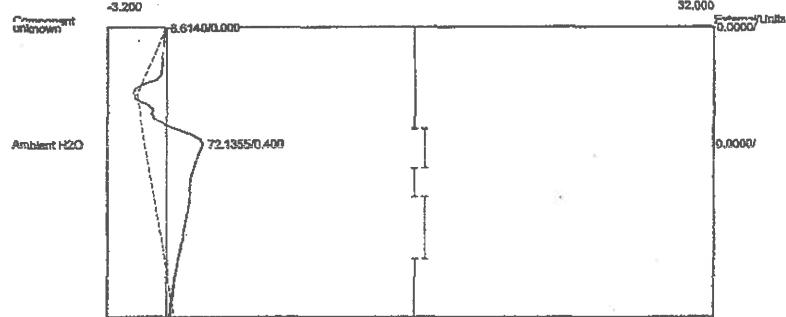
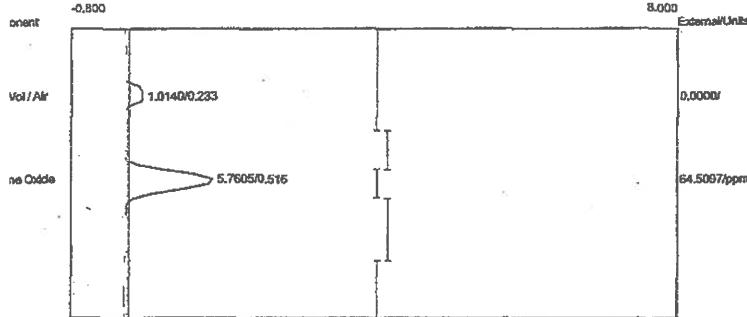
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-2B07.CHR (c:\peak359)

Sample: Oxidizer Outlet

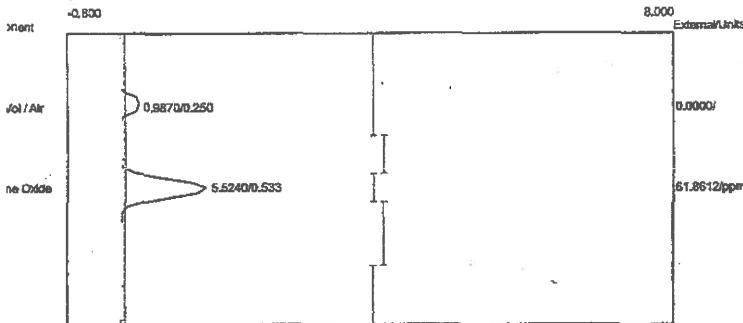
Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	1.0140	0.0000	
Ethylene Oxide	0.516	5.7605	64.5097 ppm	
		6.7745	64.5097	

Component	Retention	Area	External	Units
Ambient H <sub>2</sub> O	0.400	72.1355	0.0000	
		72.1355	0.0000	

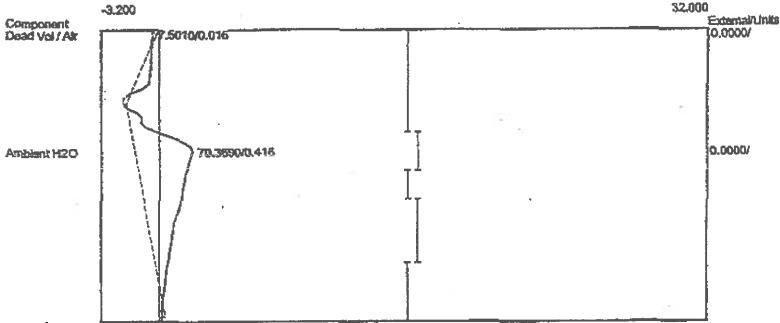
Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:28:10  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B08.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	0.9870	0.0000	
Ethylene Oxide	0.533	5.5240	61.8612	ppm

6.5110 61.8612

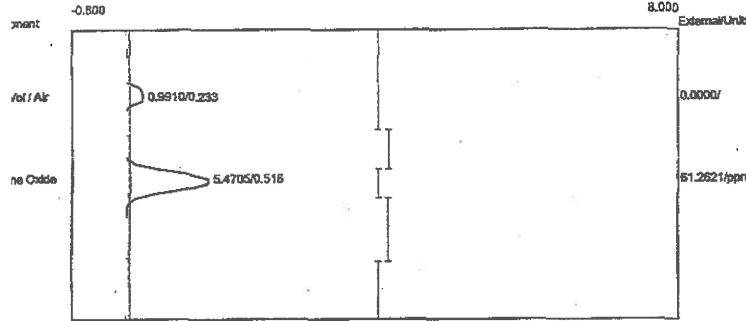
Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:28:10  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B08.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.5010	0.0000	
Ambient H2O	0.416	70.3690	0.0000	

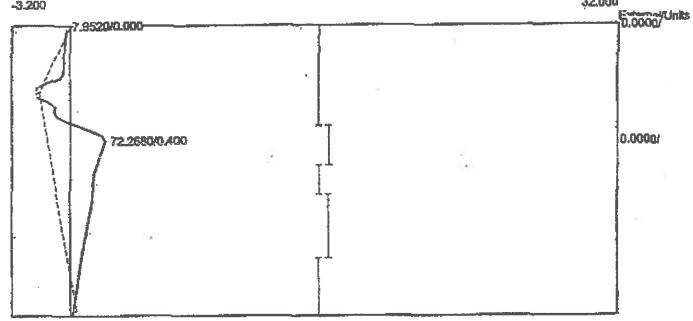
77.8700 0.0000

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:29:18  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B09.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



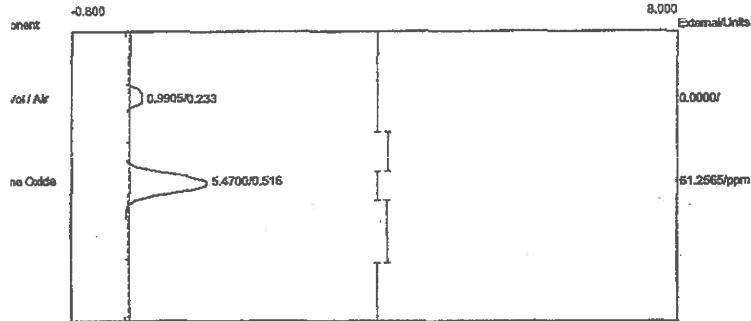
Component	Retention	Area	External	Units
ad Vol / Air	0.233	0.9910	0.0000	
ylene Oxide	0.516	5.4705	61.2621	ppm
	6.4615	61.2621		

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:29:18  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B09.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



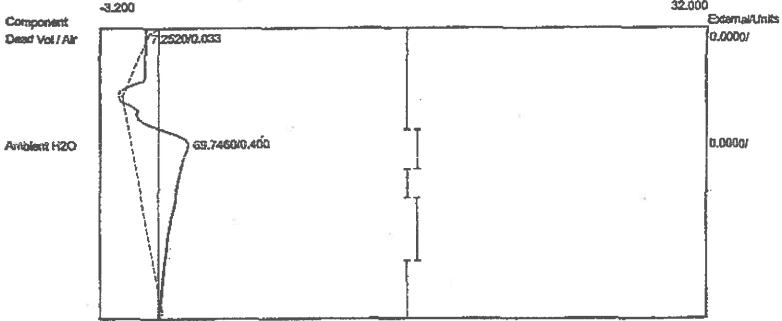
Component	Retention	Area	External	Units
Ambient H2O	0.400	72.2680	0.0000	
	72.2680	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:30:57  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B10.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



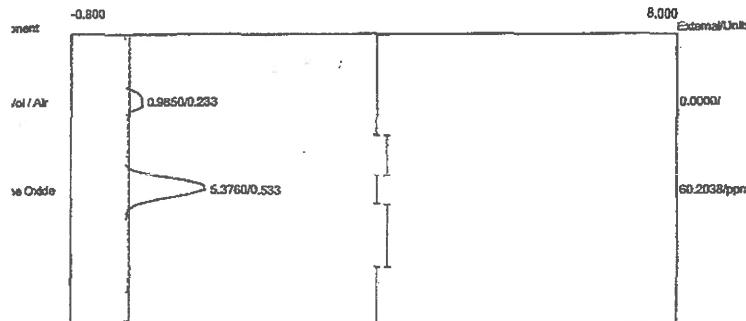
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9905	0.0000	
Ethylene Oxide	0.516	5.4700	61.2565	ppm
	6.4605	61.2565		

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:30:57  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B10.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

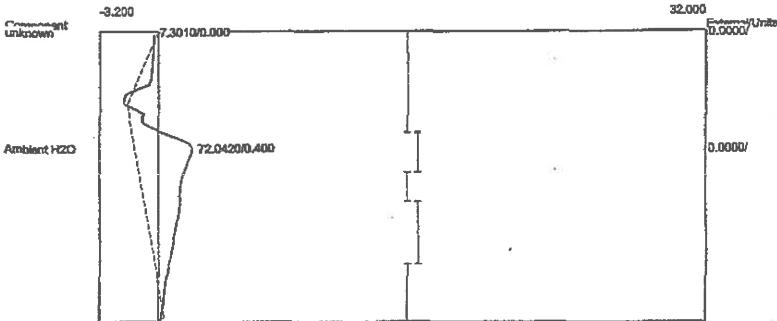


Component	Retention	Area	External	Units
Dead Vol / Air	0.033	0.033	7.2520	0.0000
Ambient H2O	0.400	0.400	69.7460	0.0000
			76.9980	0.0000

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:32:05  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B11.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



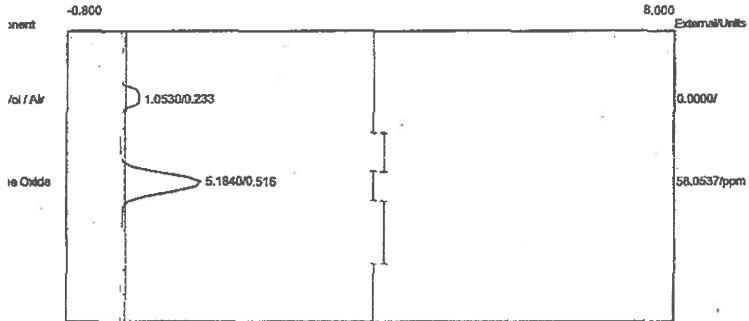
Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:32:05  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B11.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	0.9850	0.0000	
Ethylene Oxide	0.533	5.3760	60.2038	ppm

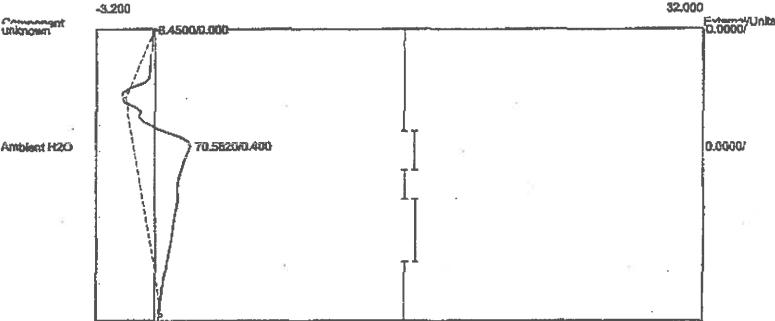
Component	Retention	Area	External	Units
Ambient H2O	0.400	72.0420	0.0000	
	72.0420	72.0420	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:33:13  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2B12.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	1.0530	0.0000	
Ethylene Oxide	0.516	5.1840	58.0537	ppm
		6.2370	58.0537	

Client: Sterigenics - Charlotte  
 Client ID: Run#2BV  
 Analysis date: 11/13/2015 12:33:13  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2B12.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

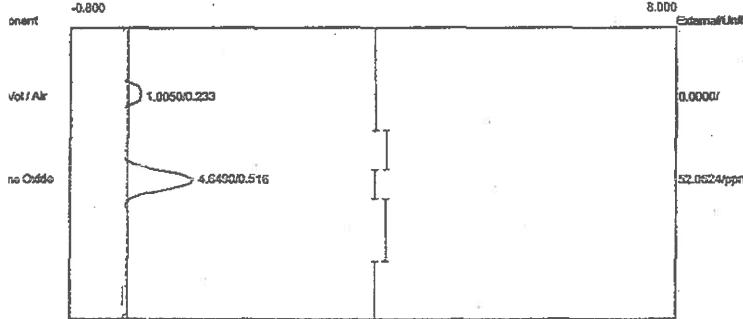


Component	Retention	Area	External	Units
Ambient H2O	0.400	70.5820	0.0000	
		70.5820	0.0000	

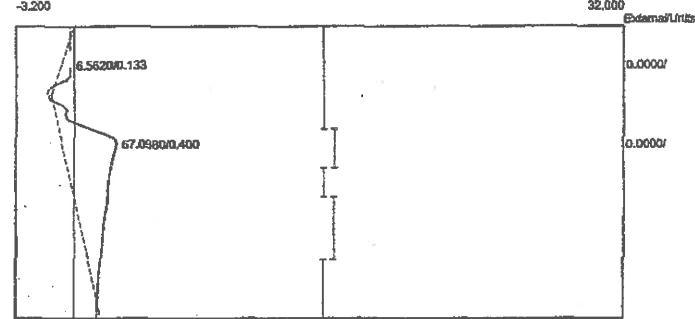
## **APPENDIX E**

### **Run #2 Chromatograms – Aeration**

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:37:04  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A01.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



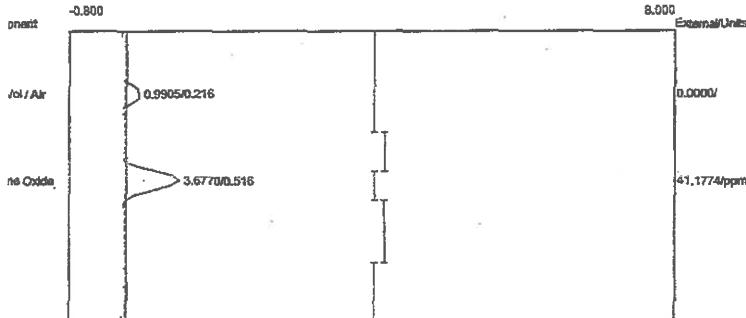
Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:37:04  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A01.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	1.0050	0.0000	
ethylene Oxide	0.516	4.6490	52.0624 ppm	

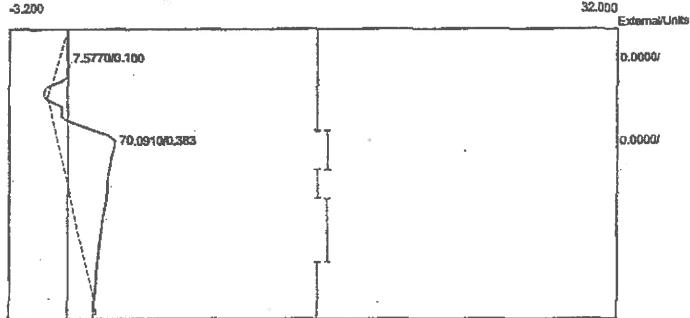
Component	Retention	Area	External	Units
Dead Vol / Air	0.133	6.5620	0.0000	
Ambient H2O	0.400	67.0980	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:42:11  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A02.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



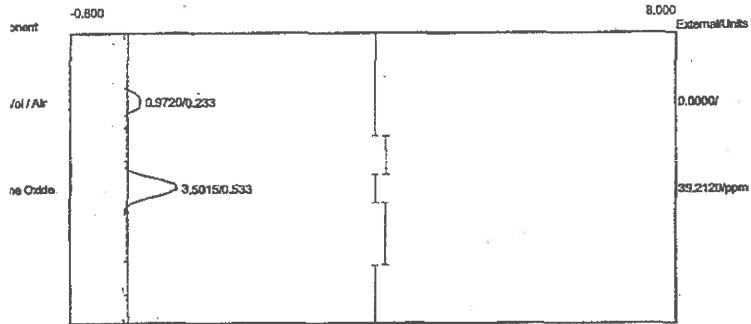
Component	Retention	Area	External	Units
Eth Vol / Air	0.216	0.9905	0.0000	
Ethylene Oxide	0.516	3.6770	41.1774 ppm	
	4.6675	41.1774		

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:42:11  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A02.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

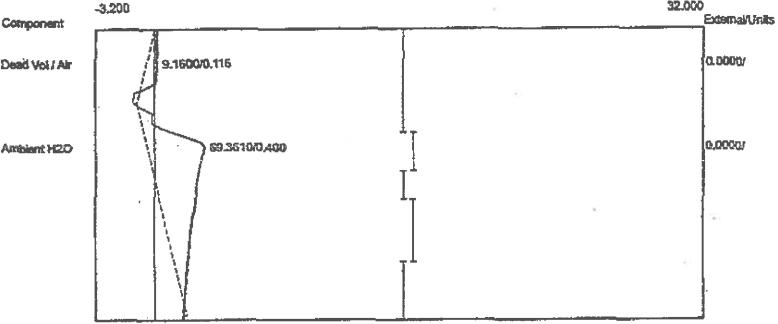


Component	Retention	Area	External	Units
Dead Vol / Air	0.100	7.5770	0.0000	
Ambient H2O	0.383	70.0910	0.0000	
	77.6680	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:47:09  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A03.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:47:09  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A03.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

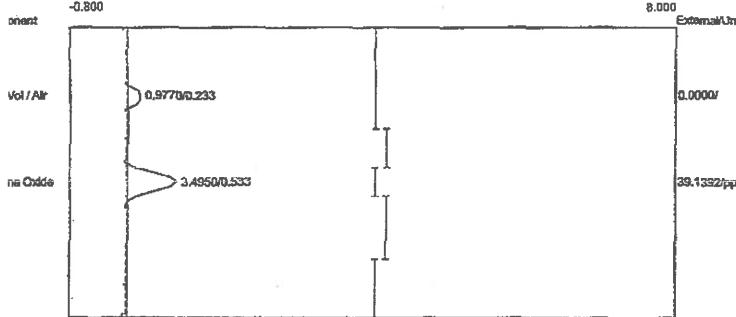


Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9720	0.0000	
Ethylene Oxide	0.533	3.5015	39.2120	ppm

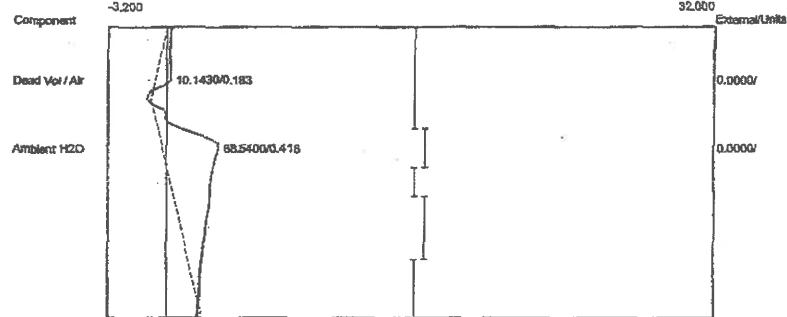
Component	Retention	Area	External	Units
Dead Vol / Air	0.116	9.1600	0.0000	
Ambient H2O	0.400	69.3610	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:52:05  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A04.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:52:05  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A04.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

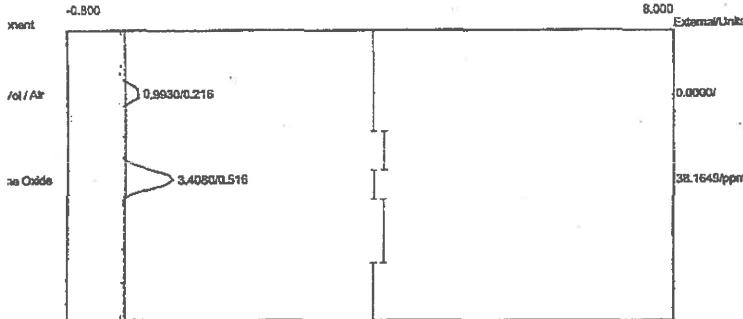


Component	Retention	Area	External	Units
Ethylene Oxide	0.233	0.9770	0.0000	
	0.533	3.4950	39.1392 ppm	
		4.4720	39.1392	



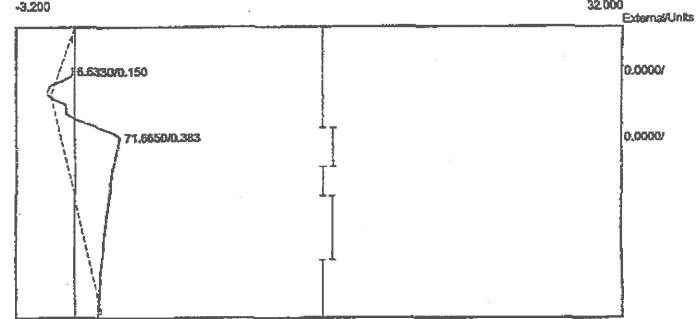
Component	Retention	Area	External	Units
Dead Vol / Air	0.183	10.1430	0.0000	
Ambient H2O	0.416	88.5400	0.0000	
		78.6830	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:57:06  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A05.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.216	0.9930	0.0000	
Ethylene Oxide	0.516	3.4080	38.1649	ppm
	4.4010		38.1649	

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 10:57:06  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A05.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.150	6.6330	0.0000	
Ambient H2O	0.383	71.6650	0.0000	
	78.2980		0.0000	

Client: Sterigenics - Charlotte

Client ID: Run#2Aer

Analysis date: 11/13/2015 11:02:23

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-2A06.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#2Aer

Analysis date: 11/13/2015 11:02:23

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

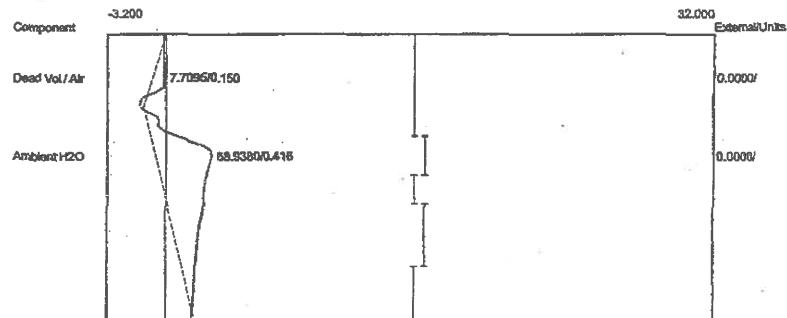
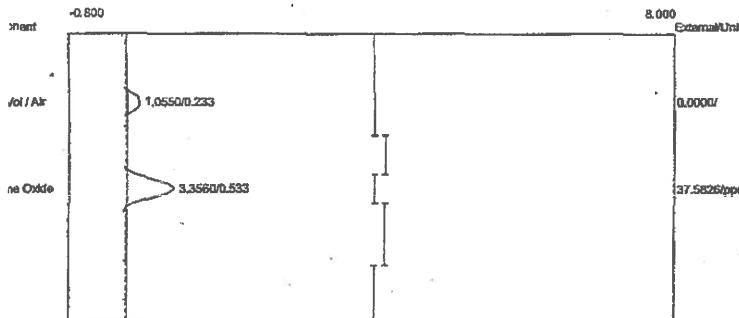
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-2A06.CHR (c:\peak359)

Sample: Oxidizer Outlet

Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	1.0550	0.0000	
Ethylene Oxide	0.533	3.3560	37.5826	ppm
	4.4110	37.5826		

Component	Retention	Area	External	Units
Dead Vol / Air	0.150	7.7095	0.0000	
Ambient H2O	0.416	68.9380	0.0000	
	76.6475	0.0000		

Client: Sterigenics - Charlotte

Client ID: Run#2Aer

Analysis date: 11/13/2015 11:07:03

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, CarboPack B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-2A07.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#2Aer

Analysis date: 11/13/2015 11:07:03

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, CarboPack B

Carrier: HELIUM

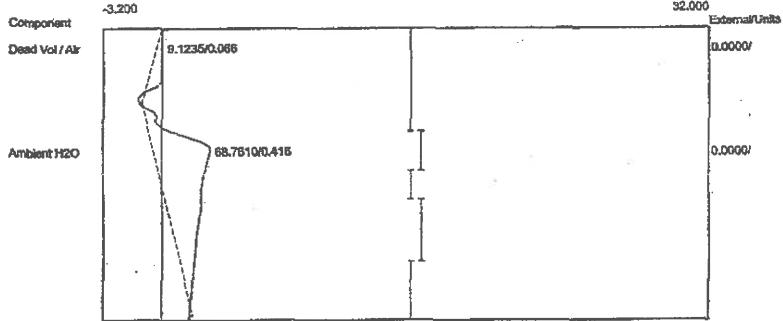
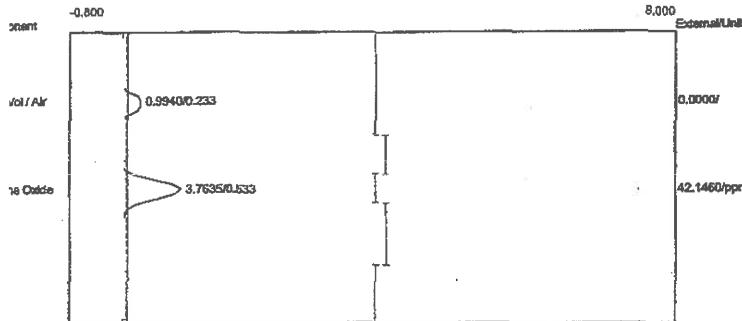
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-2A07.CHR (c:\peak359)

Sample: Oxidizer Outlet

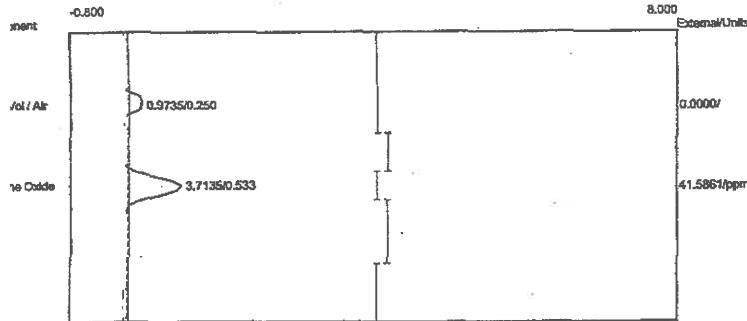
Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9940	0.0000	
Ethylene Oxide	0.533	3.7635	42.1460	ppm
	4.7575	42.1460		

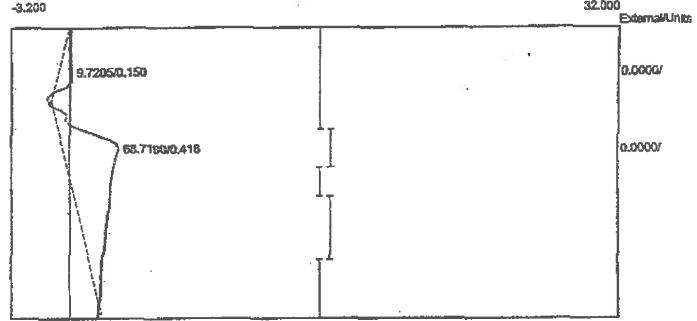
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	9.1235	0.0000	
Ambient H2O	0.416	68.7610	0.0000	
	77.8845	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:12:03  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A08.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



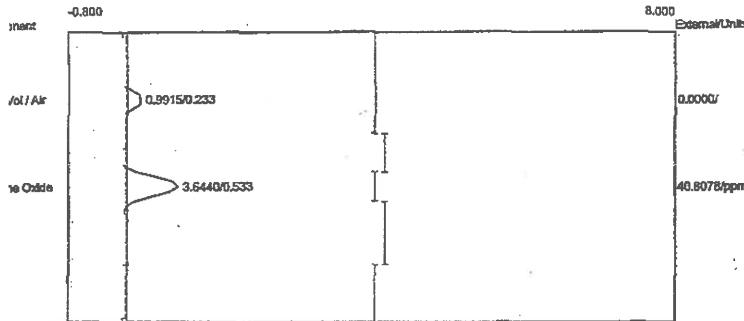
Component	Retention	Area	External	Units
Dead Vol / Air	0.250	0.9735	0.0000	
Ethylene Oxide	0.533	3.7135	41.5861	ppm
	4.6870	41.5861		

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:12:03  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A08.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



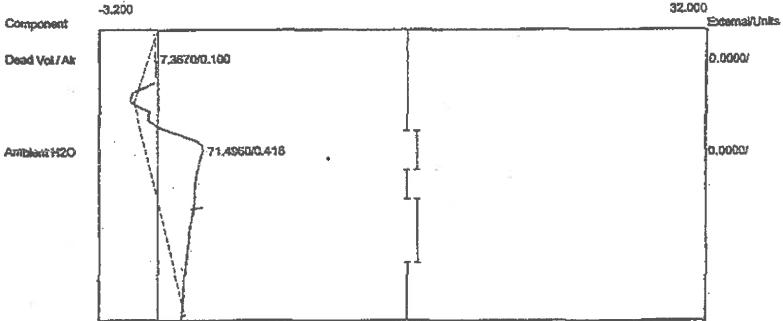
Component	Retention	Area	External	Units
Dead Vol / Air	0.150	9.7205	0.0000	
Ambient H2O	0.416	68.7190	0.0000	
		78.4395	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:17:07  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A09.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9915	0.0000	
Ethylene Oxide	0.533	3.6440	40.8078	ppm
	4.6355			

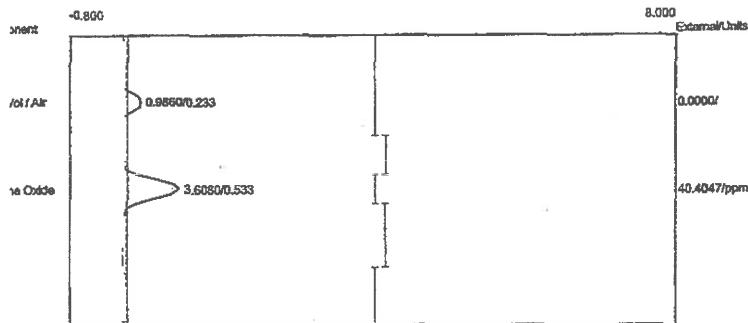
Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:17:07  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A09.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



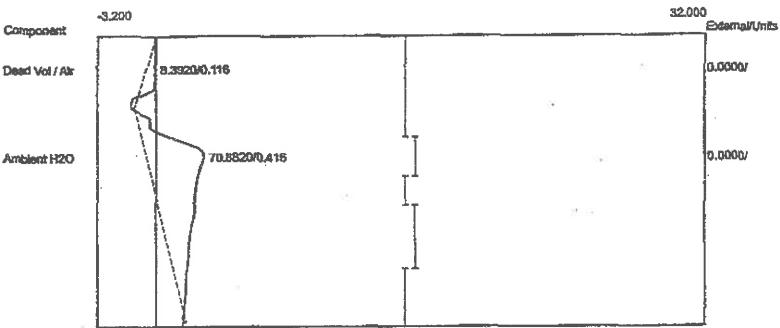
Component	Retention	Area	External	Units
Dead Vol / Air	0.100	7.3670	0.0000	
Ambient H2O	0.416	71.4960	0.0000	
	78.8630			

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 alysis date: 11/13/2015 11:22:10  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carboback B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A10.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:22:10  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carboback B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A10.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

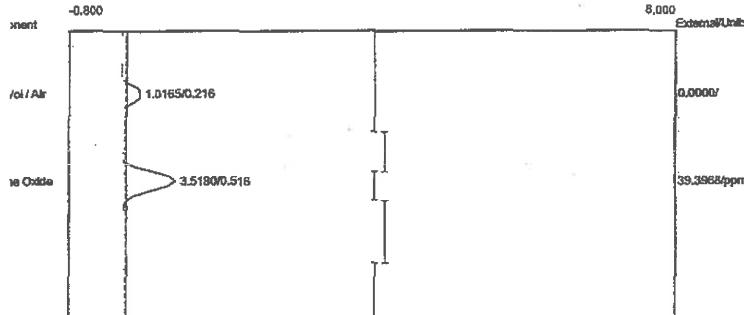


Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9860	0.0000	
Vinylene Oxide	0.533	3.6080	40.4047	ppm
	4.5940	40.4047		



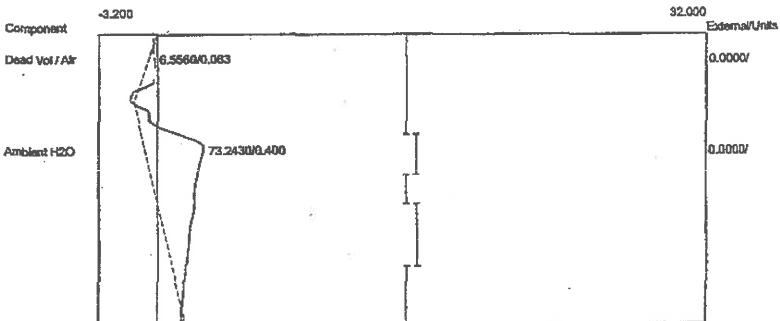
Component	Retention	Area	External	Units
Dead Vol / Air	0.116	8.3920	0.0000	
Ambient H2O	0.416	70.8820	0.0000	
	79.2740	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:27:04  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A11.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



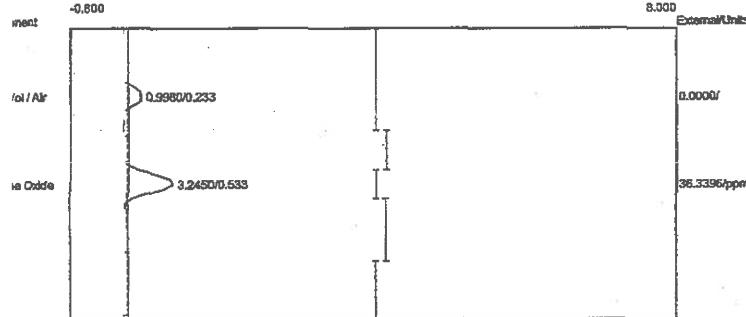
Component	Retention	Area	External	Units
Dead Vol / Air	0.216	1.0165	0.0000	
Ethylene Oxide	0.516	3.5180	39.3968 ppm	
	4.5345	4.5345	39.3968	

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:27:04  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A11.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



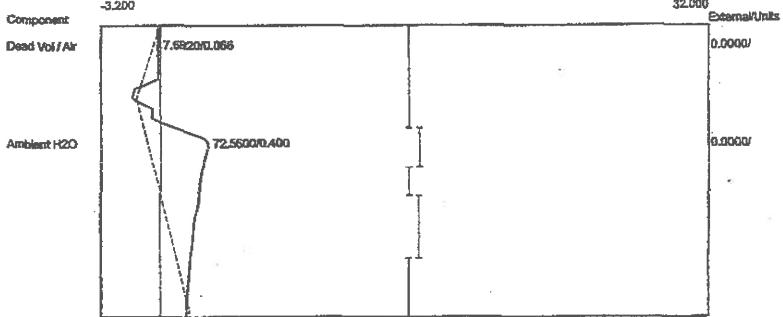
Component	Retention	Area	External	Units
Dead Vol / Air	0.083	6.5560	0.0000	
Ambient H2O	0.400	73.2430	0.0000	
	79.7990	79.7990	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:32:05  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-2A12.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9980	0.0000	
Ethylene Oxide	0.533	3.2450	36.3396 ppm	
	4.2430	36.3396		

Client: Sterigenics - Charlotte  
 Client ID: Run#2Aer  
 Analysis date: 11/13/2015 11:32:05  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-2A12.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



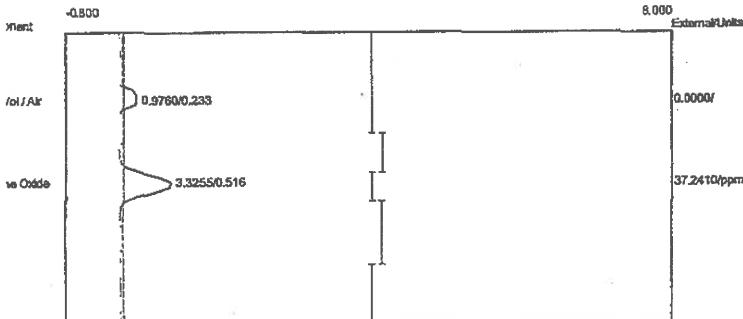
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	7.6920	0.0000	
Ambient H2O	0.400	72.5600	0.0000	
	80.2520	0.0000		

## **APPENDIX F**

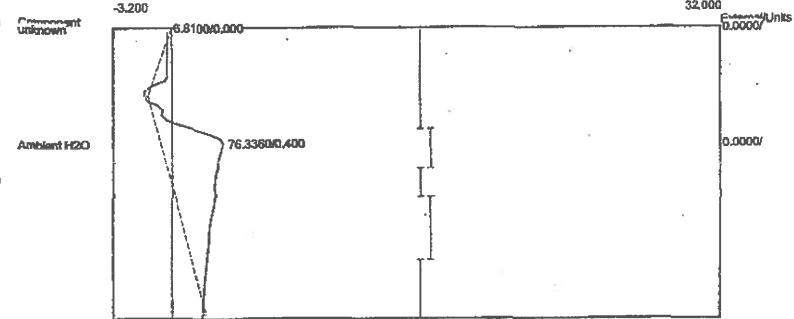
### **Run #3 Chromatograms – Backvent**

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:24:12  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B01.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:24:12  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B01.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

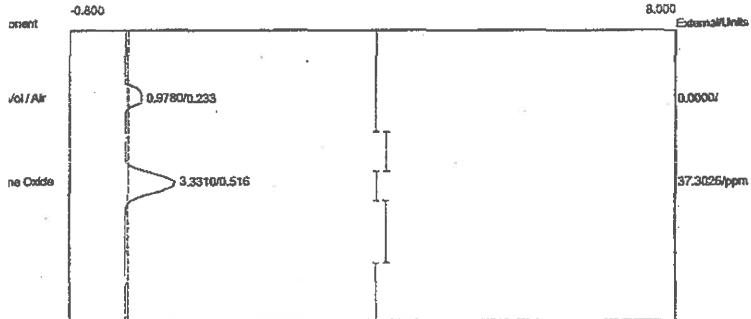


Component	Retention	Area	External	Units
Vol / Air	0.233	0.9760	0.0000	
Ethylene Oxide	0.516	3.3255	37.2410	ppm
	4.3015	37.2410		



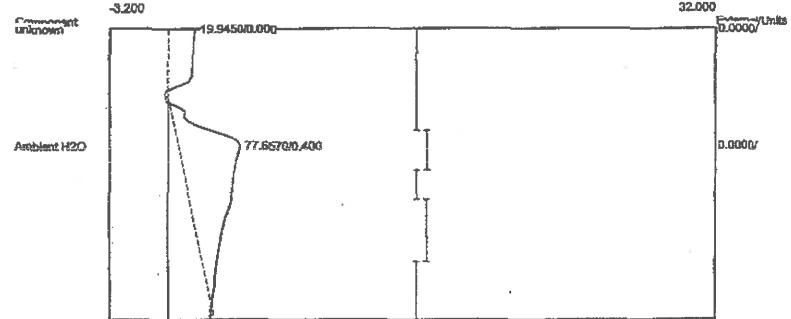
Component	Retention	Area	External	Units
Ambient H2O	0.400	76.3360	0.0000	
	76.3360	76.3360	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:25:28  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B02.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	0.9780	0.0000	
Ethylene Oxide	0.516	3.3310	37.3026	ppm

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:25:28  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B02.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Ambient H2O	0.400	19.9450	0.0000	
	77.6570	77.6570	0.0000	

Client: Sterigenics - Charlotte

Client ID: Run#3BV

alysis date: 11/13/2015 14:26:40

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbo pack B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-3B03.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#3BV

Analysis date: 11/13/2015 14:26:40

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbo pack B

Carrier: HELIUM

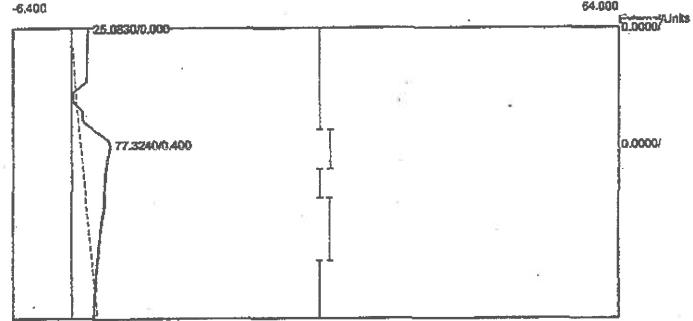
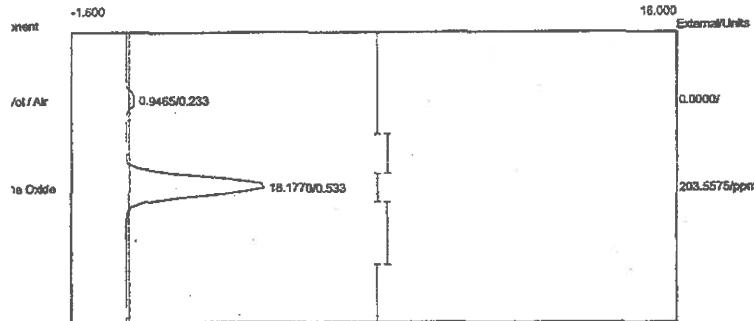
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-3B03.CHR (c:\peak359)

Sample: Oxidizer Outlet

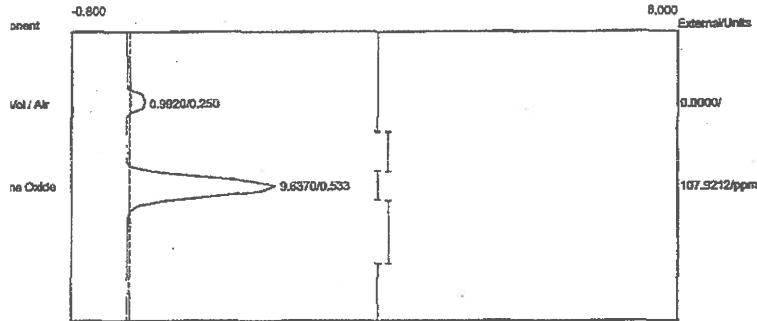
Operator: D. Kremer



Component	Retention	Area	External	Units
Vol / Air	0.233	0.9465	0.0000	
Ethylene Oxide	0.533	18.1770	203.5575	ppm
	19.1235	203.5575		

Component	Retention	Area	External	Units
Ambient H2O	0.400	77.3240	0.0000	
	77.3240	0.0000		

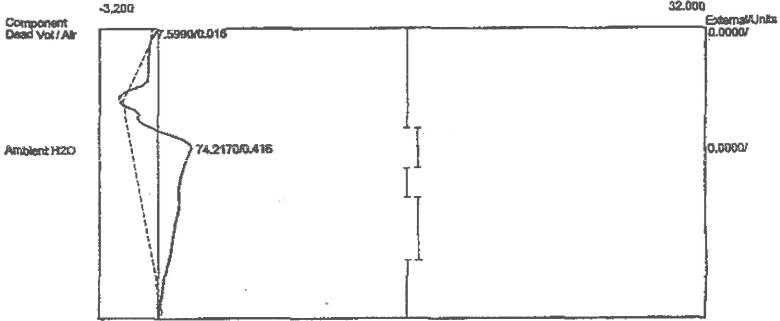
Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:27:48  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B04.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.250	0.9920	0.0000	
Ethylene Oxide	0.533	9.6370	107.9212	ppm

10.6290 107.9212

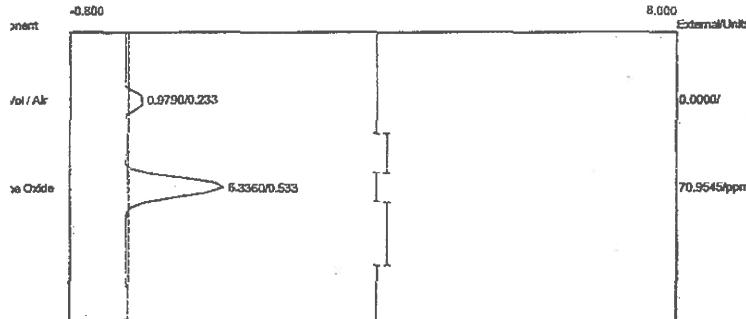
Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:27:48  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B04.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.5990	0.0000	
Ambient H2O	0.416	74.2170	0.0000	

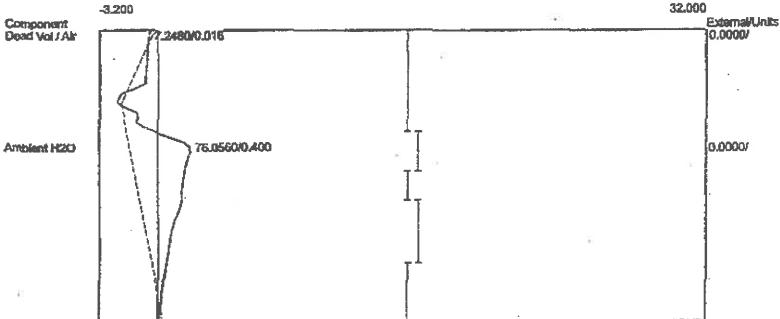
81.8160 0.0000

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:29:03  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B05.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9790	0.0000	
Ethylene Oxide	0.533	6.3360	70.9545	ppm

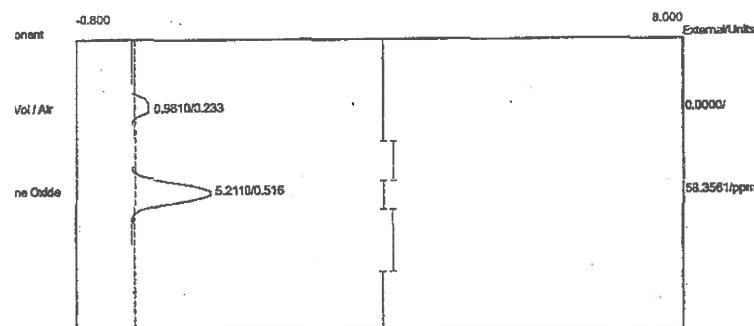
Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:29:03  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B05.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



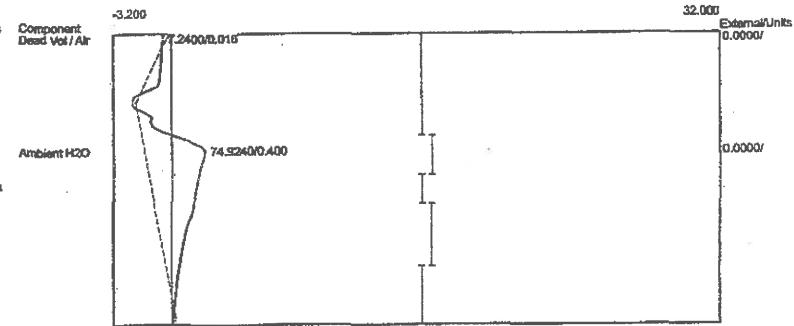
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.2480	0.0000	
Ambient H2O	0.400	76.0560	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:30:21  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B06.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:30:21  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B06.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

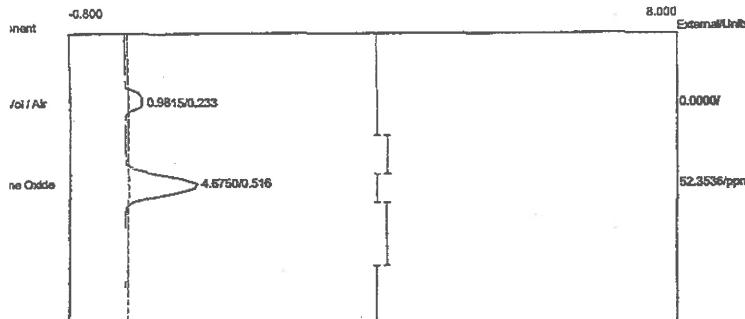


Component	Retention	Area	External	Units
Ethylene Oxide	0.233	0.9810	0.0000	
Ethylene Oxide	0.516	5.2110	58.3561	ppm
	6.1920	58.3561		



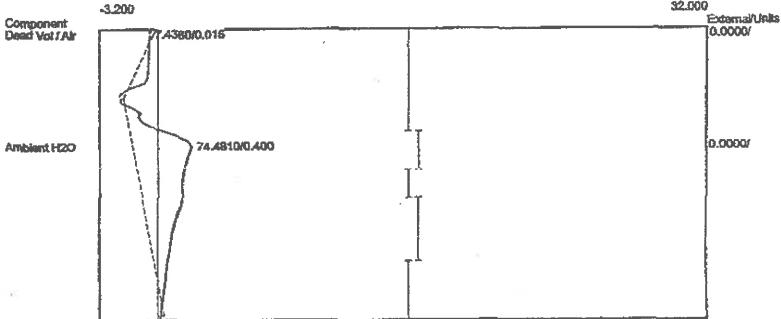
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.2400	0.0000	
Ambient H2O	0.400	74.9240	0.0000	
	82.1640	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 analysis date: 11/13/2015 14:31:35  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carboback B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B07.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



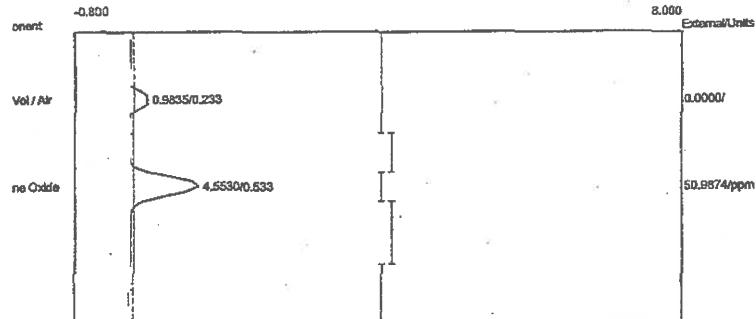
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9815	0.0000	
Ethylene Oxide	0.516	4.6750	52.3536	ppm
	5.6565	52.3536		

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:31:35  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carboback B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B07.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



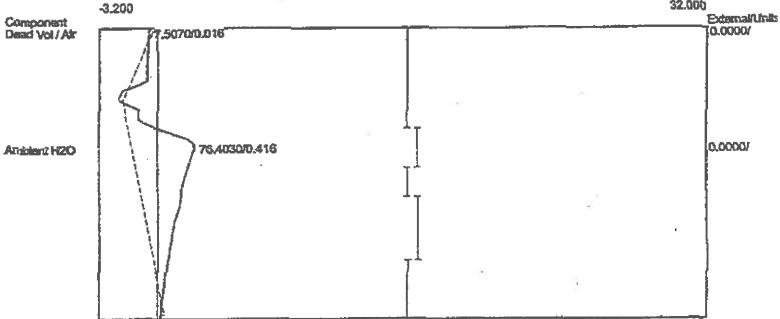
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.4380	0.0000	
Ambient H2O	0.400	74.4810	0.0000	
		81.9190	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:32:57  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B08.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Ethylene Oxide	0.233	0.9835	0.0000	
	0.533	4.5530	50.9874	ppm
		5.5365	50.9874	

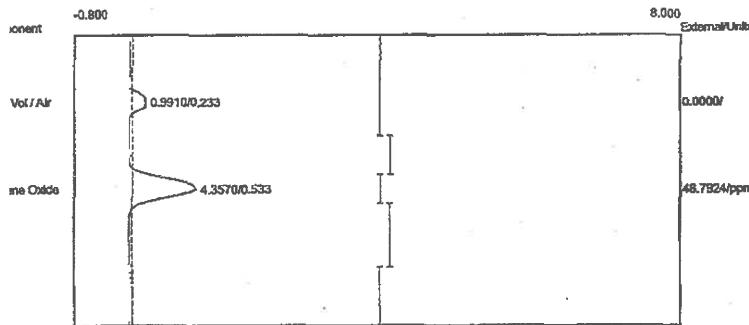
Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:32:57  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B08.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



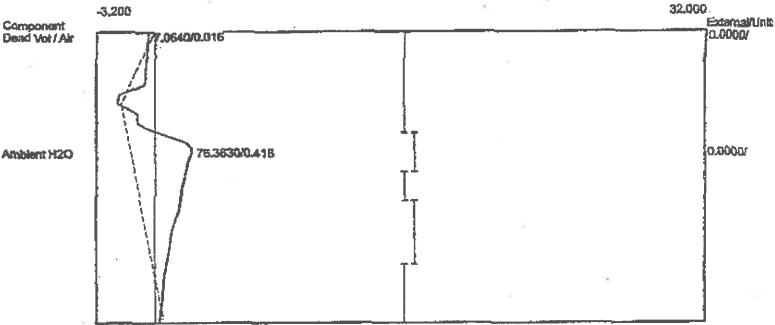
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.5070	0.0000	
Ambient H2O	0.416	76.4030	0.0000	
		83.9100	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:34:16  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B09.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:34:16  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B09.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

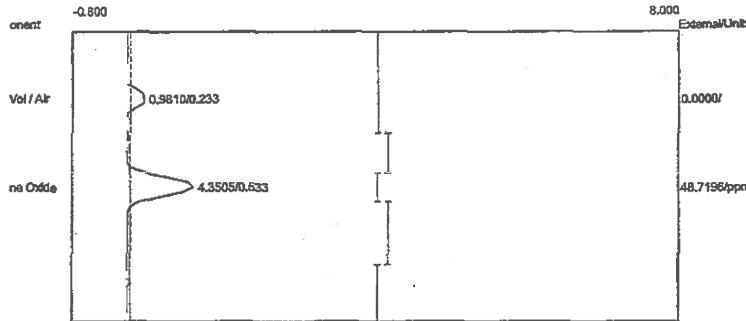


Component	Retention	Area	External	Units
Ethylene Oxide	0.233	0.9910	0.0000	
Ethylene Oxide	0.533	4.3570	48.7924	ppm
	5.3480	48.7924		



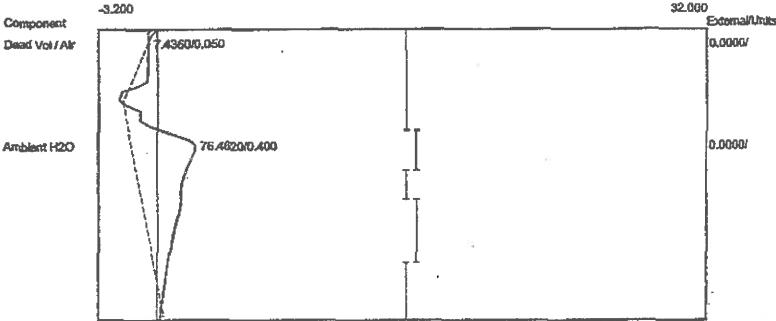
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.0640	0.0000	
Ambient H2O	0.416	76.3630	0.0000	
	83.4270	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:35:44  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3B10.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9810	0.0000	
Ethylene Oxide	0.533	4.3505	48.7196	ppm
	5.3315	48.7196		

Client: Sterigenics - Charlotte  
 Client ID: Run#3BV  
 Analysis date: 11/13/2015 14:35:44  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3B10.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.050	7.4360	0.0000	
Ambient H2O	0.400	76.4620	0.0000	
	83.8980	0.0000		

Client: Sterigenics - Charlotte

Client ID: Run#3BV

Analysis date: 11/13/2015 14:37:25

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Data file: 1SterCLT2015-3B11.CHR (c:\peak359)

Sample: Oxidizer Inlet

Operator: D. Kremer

Client: Sterigenics - Charlotte

Client ID: Run#3BV

Analysis date: 11/13/2015 14:37:25

Method: Direct Injection

Description: CHANNEL 2 - PID

Column: 1% SP-1000, CarboPak B

Carrier: HELIUM

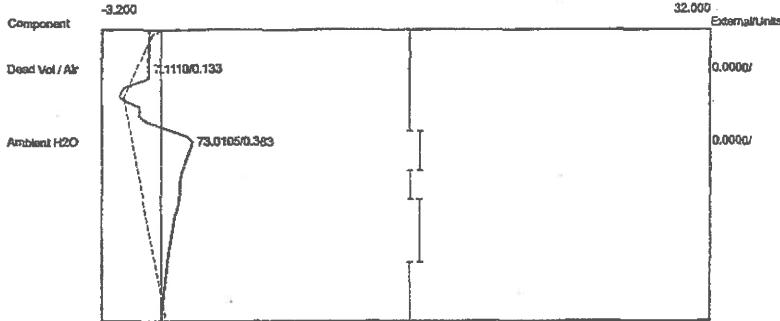
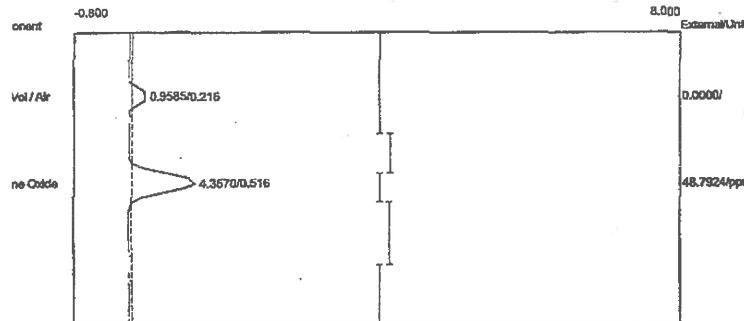
Temp. prog: eto-100.tem

Components: eto2-100.cpt

Data file: 2SterCLT2015-3B11.CHR (c:\peak359)

Sample: Oxidizer Outlet

Operator: D. Kremer



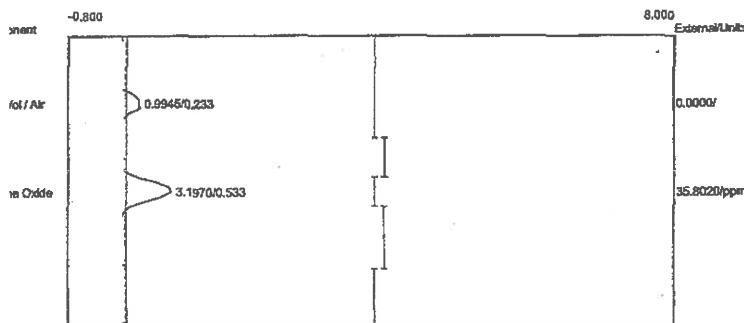
Component	Retention	Area	External	Units
Ethylene Oxide	0.216	0.9585	0.0000	
	0.516	4.3570	48.7924 ppm	
	5.3155	48.7924		

Component	Retention	Area	External	Units
Dead Vol / Air	0.133	7.1110	0.0000	
Ambient H2O	0.383	73.0105	0.0000	
		80.1215	0.0000	

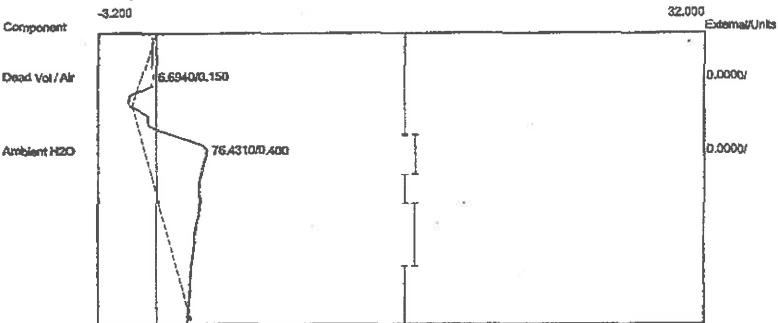
**APPENDIX G**  
**Run #3 Chromatograms – Aeration**

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:37:13  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A01.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:37:13  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A01.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

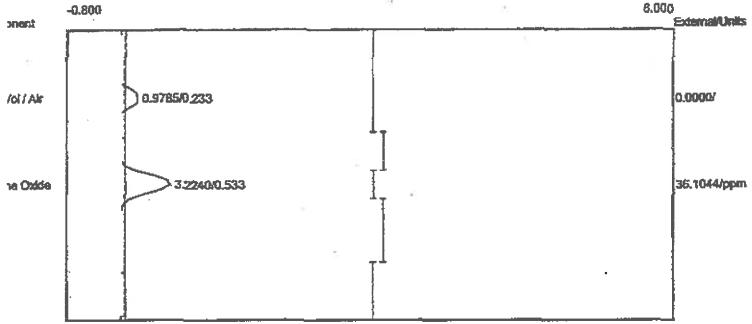


Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9945	0.0000	
Ethylene Oxide	0.533	3.1970	35.8020 ppm	



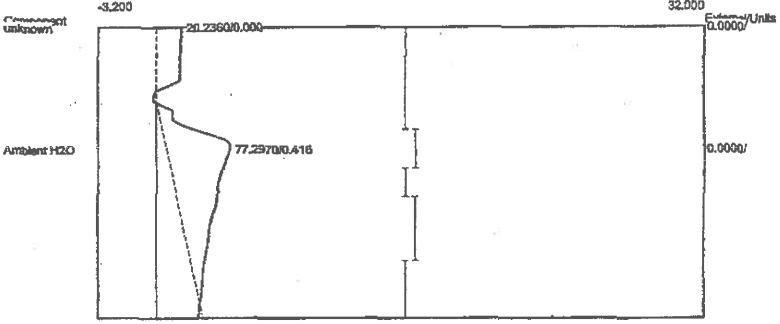
Component	Retention	Area	External	Units
Dead Vol / Air	0.150	6.6940	0.0000	
Ambient H2O	0.400	76.4310	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:42:34  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A02.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



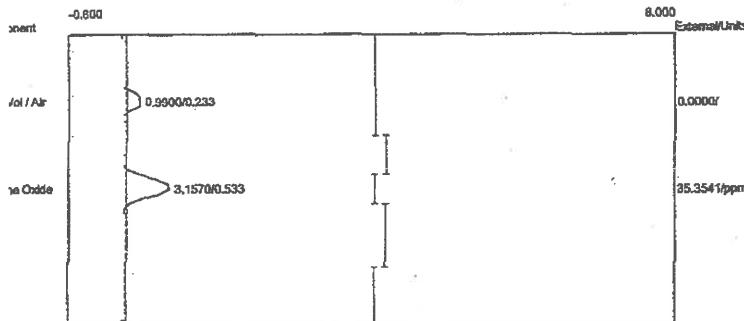
Component	Retention	Area	External	Units
Vol / Air	0.233	0.9785	0.0000	
Ethylene Oxide	0.533	3.2240	36.1044	ppm
	4.2025		36.1044	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:42:34  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A02.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



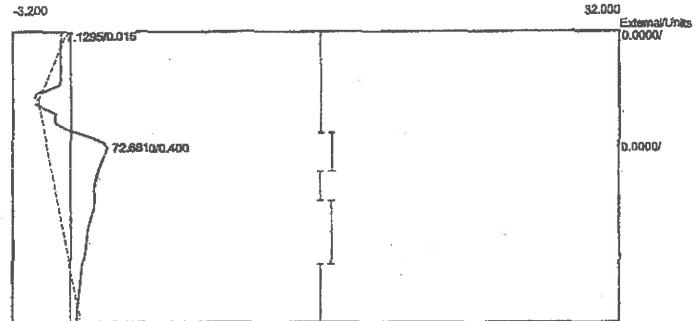
Component	Retention	Area	External	Units
Ambient H2O	0.416	77.2970	0.0000	
	77.2970		0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 alysis date: 11/13/2015 12:47:04  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A03.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



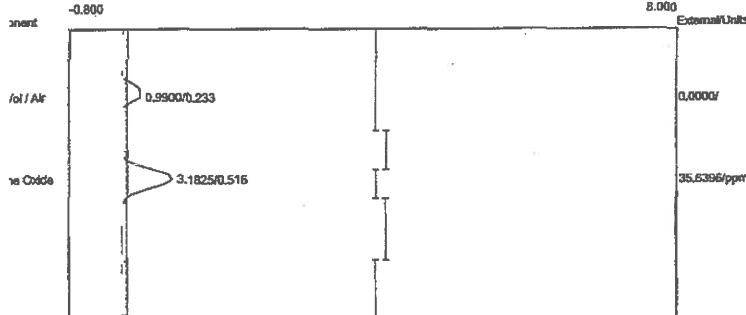
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9900	0.0000	
ylene Oxide	0.533	3.1570	35.3541	ppm
	4.1470	35.3541		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:47:04  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A03.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



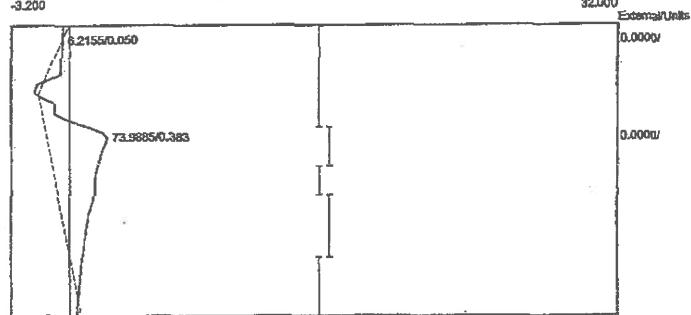
Component	Retention	Area	External	Units
Dead Vol / Air	0.016	7.1295	0.0000	
Ambient H2O	0.400	72.6810	0.0000	
		79.8105	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:52:37  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A04.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



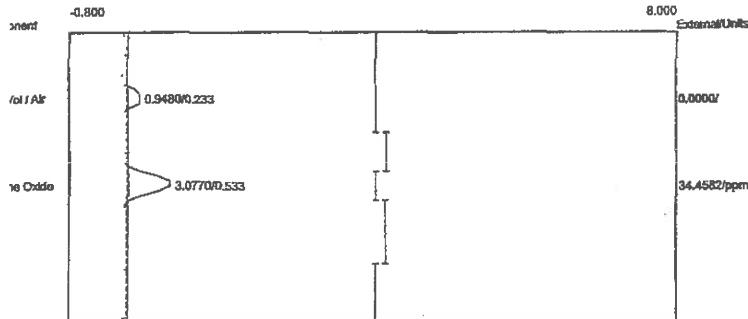
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9900	0.0000	
Ethylene Oxide	0.516	3.1825	35.6396	ppm
	4.1725	35.6396		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:52:37  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbopack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A04.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



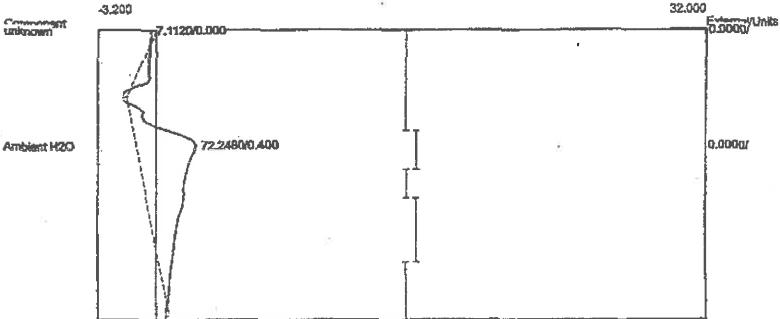
Component	Retention	Area	External	Units
Dead Vol / Air	0.050	6.2155	0.0000	
Ambient H2O	0.383	73.9885	0.0000	
	80.2040	80.2040	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:57:24  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A05.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



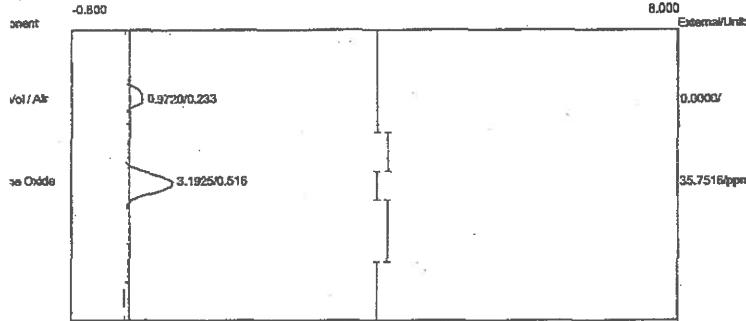
Component	Retention	Area	External	Units
Vol / Air	0.233	0.9480	0.0000	
Ethylene Oxide	0.533	3.0770	34.4582 ppm	
	4.0250	34.4582		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 12:57:24  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A05.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



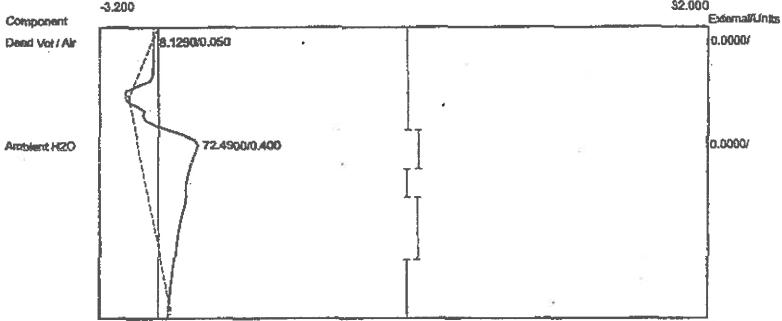
Component	Retention	Area	External	Units
Ambient H2O	0.400	72.2480	0.0000	
	72.2480	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:02:06  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A06.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



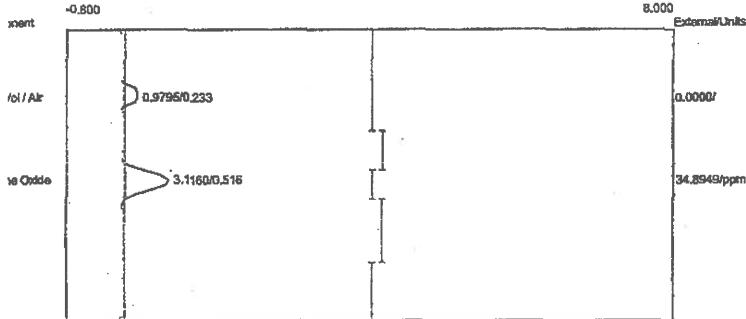
Component	Retention	Area	External	Units
Eth Vol / Air	0.233	0.9720	0.0000	
Ethylene Oxide	0.516	3.1925	35.7516	ppm
	4.1645		35.7516	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:02:06  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A06.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

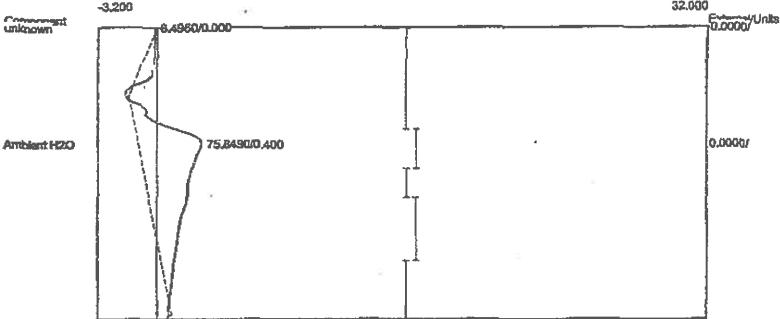


Component	Retention	Area	External	Units
Dead Vol / Air	0.050	8.1290	0.0000	
Ambient H2O	0.400	72.4900	0.0000	
		80.6190	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:07:32  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A07.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:07:32  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A07.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

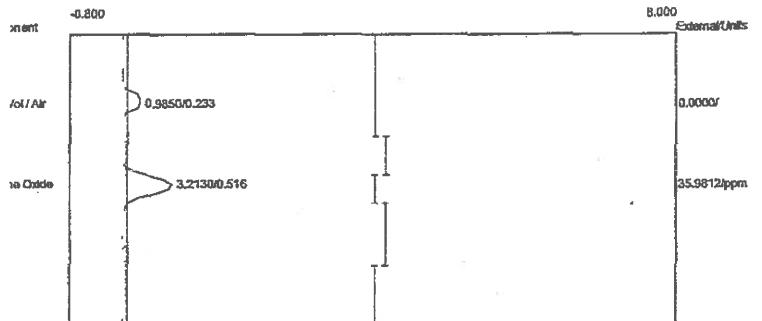


Component	Retention	Area	External	Units
Vol / Air	0.233	0.9795	0.0000	
Ethylene Oxide	0.516	3.1160	34.8949	ppm
	4.0955	34.8949		

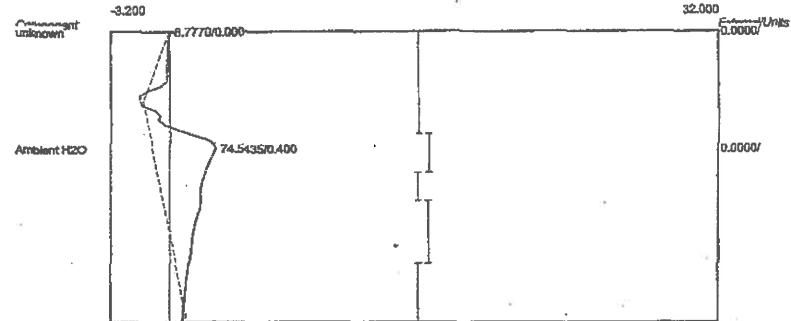
Component	Retention	Area	External	Units
Ambient H2O	0.400	75.8490	0.0000	
	75.8490	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 analysis date: 11/13/2015 13:12:03  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carboback B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A08.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:12:03  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carboback B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A08.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer

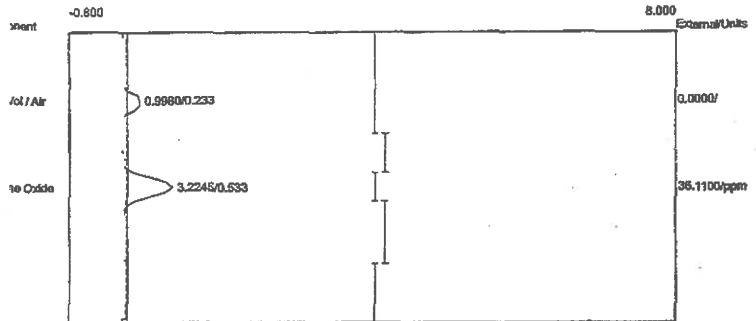


Component	Retention	Area	External	Units
Vol / Air	0.233	0.9850	0.0000	
Ethylene Oxide	0.516	3.2130	35.9812	ppm
	4.1980		35.9812	



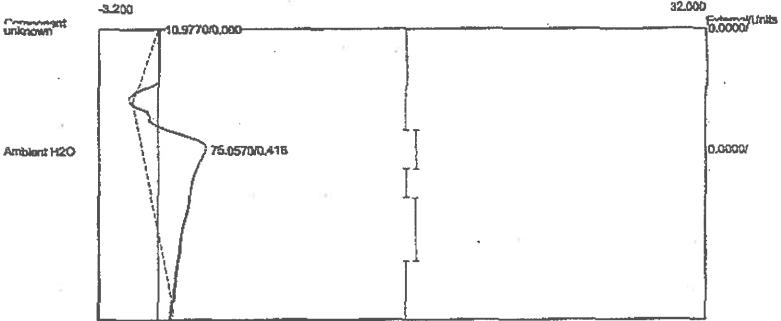
Component	Retention	Area	External	Units
Ambient H2O	0.400	74.5435	0.0000	
	74.5435		0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:17:26  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A09.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



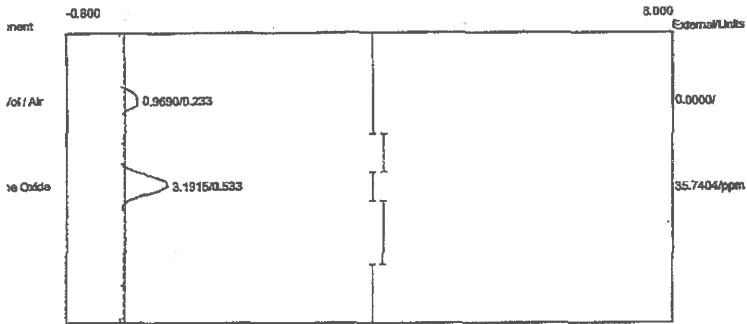
Component	Retention	Area	External	Units
Vol / Air	0.233	0.9980	0.0000	
Ethylene Oxide	0.533	3.2245	36.1100	ppm
	4.2225	36.1100		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:17:26  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A09.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



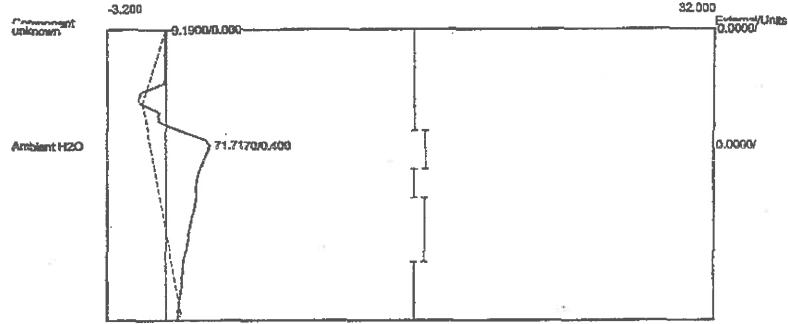
Component	Retention	Area	External	Units
Ambient H2O	0.416	10.9770	0.0000	
	75.0570	0.0000		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:22:07  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A10.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



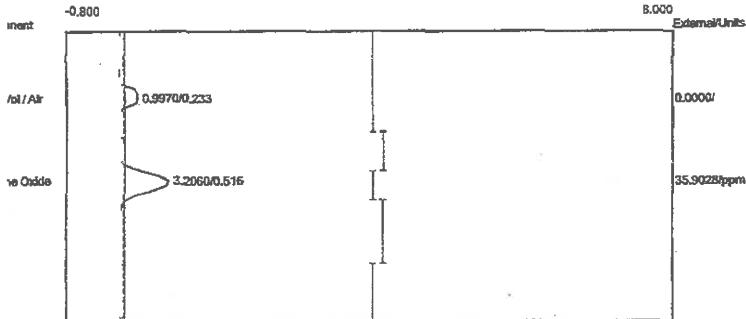
Component	Retention	Area	External	Units
1-Vol / Air	0.233	0.9690	0.0000	
Ethylene Oxide	0.533	3.1915	35.7404	ppm
	4.1605	35.7404		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:22:07  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A10.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



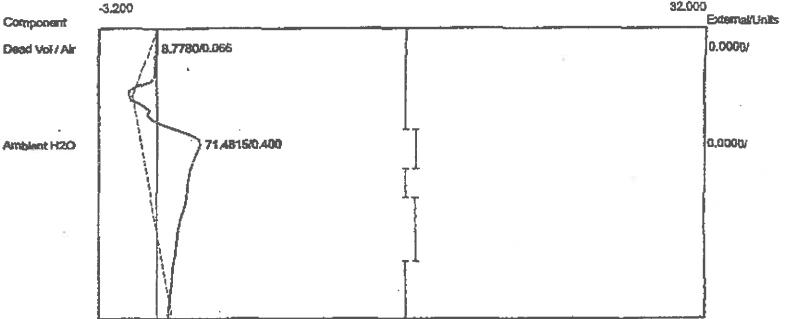
Component	Retention	Area	External	Units
Ambient H2O	0.400	71.7170	0.0000	
	71.7170	71.7170	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:27:39  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID.  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A11.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



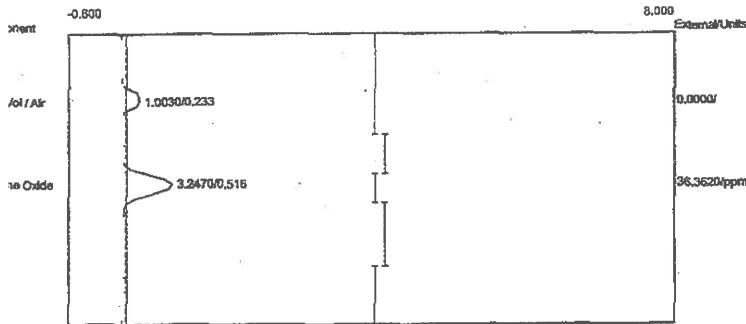
Component	Retention	Area	External	Units
Dead Vol / Air	0.233	0.9970	0.0000	
Ethylene Oxide	0.516	3.2060	35.9028 ppm	
	4.2030	35.9028		

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:27:39  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, Carbo pack B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A11.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



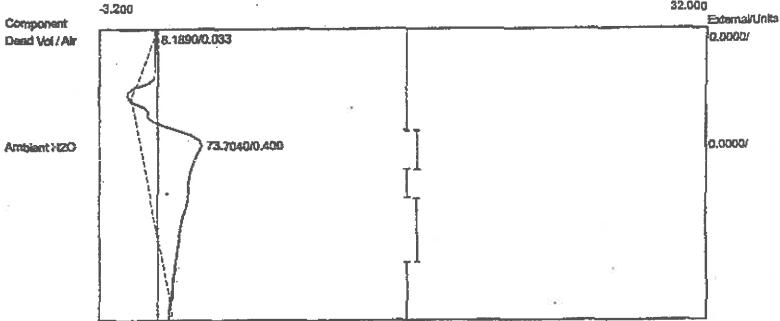
Component	Retention	Area	External	Units
Dead Vol / Air	0.066	8.7780	0.0000	
Ambient H2O	0.400	71.4815	0.0000	
		80.2595	0.0000	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:32:09  
 Method: Direct Injection  
 Description: CHANNEL 1 - FID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto1-100.cpt  
 Data file: 1SterCLT2015-3A12.CHR (c:\peak359)  
 Sample: Oxidizer Inlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.233	1.0030	0.0000	
Ethylene Oxide	0.516	3.2470	36.3620	ppm
	4.2500		36.3620	

Client: Sterigenics - Charlotte  
 Client ID: Run#3Aer  
 Analysis date: 11/13/2015 13:32:09  
 Method: Direct Injection  
 Description: CHANNEL 2 - PID  
 Column: 1% SP-1000, CarboPak B  
 Carrier: HELIUM  
 Temp. prog: eto-100.tem  
 Components: eto2-100.cpt  
 Data file: 2SterCLT2015-3A12.CHR (c:\peak359)  
 Sample: Oxidizer Outlet  
 Operator: D. Kremer



Component	Retention	Area	External	Units
Dead Vol / Air	0.033	8.1890	0.0000	
Ambient H2O	0.400	73.7040	0.0000	
		81.8930	0.0000	

**APPENDIX H**  
**Field Data and Calculation Worksheets**

# ECSi, Inc.

## Ethylene Oxide Mass Emissions Data and Calculations

Sterigenics U.S., LLC. - Charlotte, North Carolina

11/13/15 - Backvent Runs 1-3

<u>DeltaP</u>	<u>SqRtDeltaP</u>	<u>Temp (F)</u>	<u>ppm EtO</u>	<u>mw =</u>	28.51
Run #1				<u>stack area =</u>	4.91
0.41	0.6403	200	0.01	<u>press =</u>	29.05
0.41	0.6403	201	0.01	<u>Tstd =</u>	528
0.41	0.6403	202	0.01	<u>Pstd =</u>	29.92
0.41	0.6403	203	0.01	<u>Cp =</u>	0.99
0.41	0.6403	203	0.01	<u>Kp =</u>	85.49
0.41	0.6403	203	0.01	<u>Velocity =</u>	48.6 ft/sec
0.41	0.6403	204	0.01	<u>Flow =</u>	10689 dscfm
0.41	0.6403	204	0.01		
0.41	0.6403	204	0.01	<u>MWeto =</u>	44.05
0.41	0.6403	203	0.01	<u>MolVol =</u>	385.32
Run #2		Average =	0.0100	<u>ppmv/ft3 =</u>	1000000
0.41	0.6403	206	0.01		
0.41	0.6403	206	0.01	<u>Run #1 Outlet</u>	
0.41	0.6403	206	0.01	<u>EtO Mass Flow =</u>	0.000008 lbs/min
0.41	0.6403	206	0.01	<u>EtO Mass Flow =</u>	0.000475 lbs/hr
0.41	0.6403	207	0.01	<u>Run #1 Inlet</u>	
0.41	0.6403	207	0.01	<u>Inlet Flow =</u>	10700 dscfm
0.41	0.6403	207	0.01	<u>Inlet EtO Conc. =</u>	128.4 ppm
0.41	0.6403	208	0.01	<u>EtO Mass Flow =</u>	0.101654 lbs/min
0.41	0.6403	208	0.01	<u>EtO Mass Flow =</u>	6.09924 lbs/hr
0.41	0.6403	208	0.01	<u>EtO Mass Efficiency =</u>	99.992 %
0.41	0.6403	208	0.01		
0.41	0.6403	208	0.01	<u>Run #2 Outlet</u>	
Run #3		Average =	0.0100	<u>EtO Mass Flow =</u>	0.000008 lbs/min
0.41	0.6403	208	0.01	<u>EtO Mass Flow =</u>	0.000475 lbs/hr
0.41	0.6403	208	0.01	<u>Run #2 Inlet</u>	
0.41	0.6403	209	0.01	<u>Inlet Flow =</u>	10700 dscfm
0.41	0.6403	209	0.01	<u>Inlet EtO Conc. =</u>	63.04 ppm
0.41	0.6403	209	0.01	<u>EtO Mass Flow =</u>	0.049909 lbs/min
0.41	0.6403	209	0.01	<u>EtO Mass Flow =</u>	2.99452 lbs/hr
0.41	0.6403	209	0.01	<u>EtO Mass Efficiency =</u>	99.984 %
0.41	0.6403	208	0.01		
0.41	0.6403	208	0.01	<u>Run #3 Outlet</u>	
0.41	0.6403	208	0.01	<u>EtO Mass Flow =</u>	0.000008 lbs/min
0.41	0.6403	208	0.01	<u>EtO Mass Flow =</u>	0.000475 lbs/hr
3 Run Average =		Average =	0.0100	<u>Run #3 Inlet</u>	
0.41	0.6403	206.1	0.0100	<u>Inlet Flow =</u>	10700 dscfm
		= 666	degR	<u>Inlet EtO Conc. =</u>	69.60 ppm
				<u>EtO Mass Flow =</u>	0.055102 lbs/min
				<u>EtO Mass Flow =</u>	3.30613 lbs/hr
				<u>EtO Mass Efficiency =</u>	99.986 %
				<u>Control Efficiency =</u>	99.987 %

# ECSi, Inc.

## Ethylene Oxide Mass Emissions Data and Calculations

Sterigenics U.S., LLC. - Charlotte, North Carolina

11/13/15 - Aeration Runs 1-3

<u>DeltaP</u>	<u>SqRtDeltaP</u>	<u>Temp (F)</u>	<u>ppm EtO</u>	<u>mw =</u>	28.51
Run #1				stack area =	4.91
0.41	0.6403	200	0.01	press =	29.05
0.41	0.6403	200	0.01	Tstd =	528
0.41	0.6403	200	0.01	Pstd =	29.92
0.41	0.6403	200	0.01	Cp =	0.99
0.41	0.6403	200	0.01	Kp =	85.49
0.41	0.6403	200	0.01	Velocity =	48.5 ft/sec
0.41	0.6403	200	0.01	Outlet Flow =	10710 dscfm
0.41	0.6403	200	0.01	MWeto =	44.05
0.41	0.6403	200	0.01	MolVol =	385.32
0.41	0.6403	200	0.01	ppmv/ft3 =	1000000
Run #2		Average =	0.0100		
0.41	0.6403	203	0.01	<u>Run #1 Outlet</u>	
0.41	0.6403	202	0.01	EtO Mass Flow =	0.000008 lbs/min
0.41	0.6403	203	0.01	EtO Mass Flow =	0.000475 lbs/hr
0.41	0.6403	203	0.01	<u>Run #1 Inlet</u>	
0.41	0.6403	204	0.01	Inlet Flow =	10700 dscfm
0.41	0.6403	203	0.01	Inlet EtO Conc. =	27.64 ppm
0.41	0.6403	204	0.01	EtO Mass Flow =	0.021883 lbs/min
0.41	0.6403	203	0.01	EtO Mass Flow =	1.31295 lbs/hr
0.41	0.6403	204	0.01	EtO Mass Efficiency =	99.964 %
0.41	0.6403	205	0.01	<u>Run #2 Outlet</u>	
0.41	0.6403	205	0.01	EtO Mass Flow =	0.000008 lbs/min
0.41	0.6403	204	0.01	EtO Mass Flow =	0.000475 lbs/hr
Run #3		Average =	0.0100	<u>Run #2 Inlet</u>	
0.41	0.6403	207	0.01	Inlet Flow =	10700 dscfm
0.41	0.6403	207	0.01	Inlet EtO Conc. =	40.67 ppm
0.41	0.6403	207	0.01	EtO Mass Flow =	0.032198 lbs/min
0.41	0.6403	206	0.01	EtO Mass Flow =	1.93190 lbs/hr
0.41	0.6403	206	0.01	EtO Mass Efficiency =	99.975 %
0.41	0.6403	207	0.01	<u>Run #3 Outlet</u>	
0.41	0.6403	207	0.01	EtO Mass Flow =	0.000008 lbs/min
0.41	0.6403	207	0.01	EtO Mass Flow =	0.000475 lbs/hr
0.41	0.6403	207	0.01	<u>Run #3 Inlet</u>	
0.41	0.6403	207	0.01	Inlet Flow =	10700 dscfm
0.41	0.6403	207	0.01	Inlet EtO Conc. =	35.68 ppm
0.41	0.6403	207	0.01	EtO Mass Flow =	0.028248 lbs/min
0.41	0.6403	207	0.01	EtO Mass Flow =	1.69487 lbs/hr
3 Run Average =		Average =	0.0100	EtO Mass Efficiency =	99.972 %
0.41	0.6403	203.5	0.0100		
		=	663 degR		
				Average EtO Mass Control Efficiency =	99.970 %

# ETHYLENE OXIDE SOURCE TEST/CALIBRATION DATA

Client: Sterigenics - Charlotte

Source Tested: Arguil Catalytic Oxidizer

Date: 11/13/15

## PRE CALIBRATION

	Calibration Gas Conc. (ppmv)	1.10 ppm EtO	10.1 ppm EtO	100 ppm EtO	1000 ppm EtO	10080 ppm EtO			
Inlet (FID)	Area Counts #1	.098	0.91	8.83					
	Area Counts #2	.098	0.91	8.90					
	Average Area	.098	0.91	8.87					
	Audit Standard (48.8 ppmv) Result						49.2 ✓		
	Calibration Gas Conc. (ppmv)	1.10 ppm EtO	10.1 ppm EtO	100 ppm EtO					
Outlet (PID)	Area Counts #1	1.37	13.0	120					
	Area Counts #2	1.40	13.1	125					
	Average Area	1.39	13.1	123					
	Audit Standard (48.8 ppmv) Result						48.4 ✓		

Background Start Stop: 1016 1031

Run #1 1219 1234

Run #2 1423 1438

P<sub>bar</sub>: 29.05

EtO Usage (lbs/yr):   

Aeration Start Stop: 0845 0945

Run #3 1035 1055

1235 1335

%H<sub>2</sub>O: 3

Cycles Per Week:   

## POST CALIBRATION

	Calibration Gas Conc. (ppmv)	1.10 ppm EtO	10.1 ppm EtO	100 ppm EtO	1000 ppm EtO	10080 ppm EtO			
Inlet (FID)	Area Counts #1								
	Area Counts #2								
	Average Area								
	Audit Standard (48.8 ppmv) Result						48.9 ✓		
	Calibration Gas Conc. (ppmv)	1.10 ppm EtO	10.1 ppm EtO	100 ppm EtO					
Outlet (PID)	Area Counts #1								
	Area Counts #2								
	Average Area								
	Audit Standard (48.8 ppmv) Result						49.1 ✓		

ECSi

# ECSI, INC. - VELOCITY TRAVERSE DATA

Client: Sterigenics U.S., LLC.

Location: Charlotte, NC Plant

Source: Ethylene Oxide Emission Control System Inlet

Run #: 1 Date: 11/13/2015 Port Sketch:

Probe Type: Std. Baro Press: 29.05

Stack I.D.: 24 in. DSCFM: 10,700



## Port 1

Inches From Port	Point#	Delta P				Stack Temp (F)	Cyclonic Angle	Point#	Delta P				Stack Temp (F)	Cyclonic Angle
		Low	High	Average	Sq Root				Low	High	Average	Sq Root		
0.5	1	0.82	0.82	0.82	0.9055	104	0	1	0.82	0.83	0.825	0.9083	105	0
1.6	2	0.83	0.84	0.835	0.9138	104	0	2	0.84	0.84	0.84	0.9165	105	0
2.8	3	0.84	0.85	0.845	0.9192	105	0	3	0.84	0.85	0.845	0.9192	105	0
4.2	4	0.85	0.85	0.85	0.9220	105	0	4	0.85	0.85	0.85	0.9220	105	0
6.0	5	0.85	0.86	0.855	0.9247	105	0	5	0.85	0.86	0.855	0.9247	105	0
8.6	6	0.87	0.88	0.875	0.9354	105	0	6	0.87	0.88	0.875	0.9354	105	0
15.4	7	0.88	0.88	0.88	0.9381	106	0	7	0.88	0.88	0.88	0.9381	106	0
18.0	8	0.85	0.86	0.855	0.9247	106	0	8	0.86	0.87	0.865	0.9301	106	0
19.8	9	0.85	0.85	0.85	0.9220	106	0	9	0.85	0.86	0.855	0.9247	106	0
21.2	10	0.84	0.85	0.845	0.9192	106	0	10	0.84	0.85	0.845	0.9192	106	0
22.4	11	0.83	0.84	0.835	0.9138	106	0	11	0.83	0.84	0.835	0.9138	106	0
23.5	12	0.82	0.83	0.825	0.9083	107	0	12	0.82	0.83	0.825	0.9083	106	0
	13							13						
	14							14						
	15							15						
	16							16						
	17							17						
	18							18						
	19							19						
	20							20						
	21							21						
	22							22						
	23							23						
	24							24						
													Average Values:	0.8485 0.9211 105.5 0.0

# ECSI, INC. - VELOCITY TRAVERSE DATA

Client: Sterigenics U.S., LLC.  
 Location: Charlotte, NC Plant  
 Source: Ethylene Oxide Emission Control System Outlet

Run #: 1 Date: 11/13/2015 Port Sketch:  
 Probe Type: Std. Baro Press: 29.05  
 Stack I.D.: 30 in. DSCFM: 10,700

Port 1							Port 2						
Inches From Port	Point#	Delta P			Stack Temp (F)	Cyclonic Angle	Point#	Delta P			Stack Temp (F)	Cyclonic Angle	
		Low	High	Average				Low	High	Average			
0.6	1	0.39	0.39	0.39	0.6245	206	0	1	0.39	0.4	0.395	0.6285	206
2.0	2	0.4	0.4	0.4	0.6325	206	0	2	0.4	0.4	0.4	0.6325	206
3.5	3	0.41	0.41	0.41	0.6403	207	0	3	0.41	0.41	0.41	0.6403	207
5.3	4	0.41	0.42	0.415	0.6442	207	0	4	0.41	0.42	0.415	0.6442	207
7.5	5	0.42	0.43	0.425	0.6519	207	0	5	0.42	0.43	0.45	0.6708	207
10.7	6	0.42	0.43	0.425	0.6519	207	0	6	0.43	0.44	0.435	0.6595	207
19.3	7	0.43	0.43	0.43	0.6557	207	0	7	0.43	0.44	0.435	0.6595	207
22.5	8	0.43	0.44	0.435	0.6595	207	0	8	0.42	0.43	0.425	0.6519	207
24.7	9	0.42	0.43	0.425	0.6519	207	0	9	0.42	0.42	0.42	0.6481	207
26.5	10	0.41	0.42	0.415	0.6442	208	0	10	0.41	0.41	0.41	0.6403	207
28.0	11	0.4	0.41	0.405	0.6364	208	0	11	0.4	0.4	0.4	0.6325	207
29.4	12	0.39	0.39	0.39	0.6245	208	0	12	0.39	0.39	0.39	0.6245	208
	13							13					
	14							14					
	15							15					
	16							16					
	17							17					
	18							18					
	19							19					
	20							20					
	21							21					
	22							22					
	23							23					
	24							24					
												Average Values:	0.4146
													0.6438
													207.0
													0.0



**APPENDIX I**  
**Gas Certifications**



2600 CAJON BLVD., SAN BERNARDINO, CA 92411

# CERTIFIED WORKING CLASS

*Single-Certified Calibration Standard*

Phone: 909-887-2571 Fax: 909-887-0549

## CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

### Product Information

Project No.: Q2-B7164-001  
Item No.: 0202C001910TCL  
P.O. No.: VSL - D KREMER

Cylinder Number: CAL4448

Cylinder Size: CL

Certification Date: 14Apr2014

### Customer

EDSI, INC.  
PO BOX 648  
SAN CLEMENTE, CA 92672

### CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)	Accuracy (+/-%)
ETHYLENE OXIDE	1.10	PPM
NITROGEN	BALANCE	5

### TRACEABILITY

Traceable To:

Scott Reference Standard

APPROVED BY:

(Signature)  
MMI

DATE: 4-15-14



# Scott Specialty Gases

100 CALON BLVD., SAN BERNARDINO, CA 92411

## CERTIFIED WORKING CLASS

Single-Certified Calibration Standard

Phone: 909-867-2671 Fax: 909-867-0549

### CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

#### Product Information:

Project No.: 02-87164-002  
Item No.: 020200012ZOTCL  
P.O. No.: VBL-13 KREMER

Cylinder Number: CLM009292  
Cylinder Size: 2L  
Certification Date: 14Apr2014

#### Customer:

ECSI, INC.  
PO BOX 548  
SAN CLEMENTE, CA 92672

### CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)	Accuracy (+/- %)
ETHYLENE OXIDE NITROGEN	10.1      PPM BALANCE	5

### TRACEABILITY

#### Traceable To:

Scott Reference Standard

APPROVED BY: \_\_\_\_\_

DATE: 4/16/14



# Scott Specialty Gases

2600 CAJON BLVD., SAN BERNARDINO, CA 92417

## CERTIFIED WORKING CLASS

Single-Certified Calibration Standard

Phone: 909-537-2571 Fax: 909-537-2545

### CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

#### Product Information

Project No.: 02-57364-004  
Item No.: 02020001330TCL  
P.O. No.: VBL-D-KREMER

Cylinder Number: CLM011338  
Cylinder Size: 5L  
Certification Date: 14Apr2012

#### Customer

ECSI, INC  
PO BOX 848  
SAN CLEMENTE, CA 92672

#### CERTIFIED CONCENTRATION

##### Component Name

ETHYLENE OXIDE  
NITROGEN

##### Concentration (Moles)

100 PPM  
BALANCE

##### Accuracy (+/-%)

5

#### TRACEABILITY

##### Traceable To

Scott Reference Standard

APPROVED BY:

R. McElroy

DATE: 4-16-12



**Scott Specialty Gases**

2600 CAJON BLVD., SAN BERNARDINO, CA 92311

**CERTIFIED WORKING CLASS**

*Single-Certified Calibration Standard*

Phone: 909-887-2571 Fax: 800-587-0542

**CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard**

**Product Information**

Project No.: 02-57164-009  
Item No.: C2020001840FC  
P.O. No.: VEL-D KREMER

Cylinder Number: CLM002810  
Cylinder Size: CL  
Certification Date: 14Apr2014

**Customer**

ECOI, INC.  
PO BOX 842  
SAN CLEMENTE, CA 92672

**CERTIFIED CONCENTRATION**

Component Name	Concentration (Moles)	Accuracy (+/-%)
ETHYLENE OXIDE NITROGEN	1.000 RPM BALANCE	5

**TRACEABILITY**

Traceable To

Scott Reference Standard

APPROVED BY:

DATE

4-14-14

# Scott Specialty Gases

300 TAJON BLVD., SAN BERNARDINO, CA 92311

## CERTIFIED WORKING CLASS

Single-Certified Calibration Standard

Phone: 809-567-2671 Fax: 809-567-3148

### CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

#### Product Information

Project No.: Q2-S7184-006  
Item No.: 020200018407CL  
P.O. No.: VBL - G. KREMER

Cylinder Number: CLM005787  
Cylinder Size: CG  
Certification Date: 14Sep2014

#### Customer

PCSI, INC.  
PO BOX 816  
SAN CLEMENTE, CA 92672

#### CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)	Accuracy (+/- %)
ETHYLENE OXIDE NITROGEN	10.080. 8PM BALANCE	6

#### TRACEABILITY

##### Traceable To

Scott Reference Standard

APPROVED BY:

*B. Miller*  
B.M.

DATE: 4-16-12



## CERTIFICATE OF ANALYSIS

Customer Name:	RFI, Inc.	Cylinder Number:	SA25925
Stock or Analyzer Tag Number:	N/A	Product Class:	Certified Standard
Customer Reference:	Verbal, Date	Cylinder - Contents:	28 CF x 3000 PSI
MESA Reference:	002128	Cylinder CGA:	A200-1P-RR-16
Date of Certification:	4-15-2012	Analysis Method:	CG-1010-110
Recommended Shelf Life:	2 Years	Preparation Method:	Compressed

Component	Requested Concentration <sup>2</sup>	Reported Concentration <sup>3</sup>
Ethylene Oxide	50 ppm	18.8 ppm
Nitrogen	Balance	Balance

Authorized Signature:

The above analysis was performed by MESA International, Inc. using the methods described in the Request for Analysis. The cylinder contents were analyzed at the time of certification. The cylinder contents may change over time due to absorption or desorption of moisture. It is recommended that samples be taken from the cylinder periodically to monitor for changes in composition.

1. Mass difference after certification date given in initial analysis.
2. Oxygen balance test (by balance) of cylinder. By low pressure scale or dilute oxygen sampling device. However, it is generally recommended that cylinder containing vapor 70% or reduced to 1/3 be balanced. Test results will then be scaled and rolled back and forth to monitor for changes of 1% or more. Nitrogen balance up to 75%.

Additional Services: The original cylinder sample was analyzed at 5% F.O.C. using the methods described in the Request for Analysis. The cylinder was then re-sealed and returned to the cylinder manufacturer. The cylinder manufacturer will then determine if the cylinder is acceptable. According to the method of preparation described below, the cylinder was weighed several times, averaging 422.7461 ± 0.00001 g. Reference a graph below: (160.00, 8.20, 7.20, 1.00, 0.00, -0.20, -0.40, -0.60, -0.80, -1.00, -1.20, -1.40, -1.60, -1.80, -2.00, -2.20, -2.40, -2.60, -2.80, -3.00, -3.20, -3.40, -3.60, -3.80, -4.00, -4.20, -4.40, -4.60, -4.80, -5.00, -5.20, -5.40, -5.60, -5.80, -6.00, -6.20, -6.40, -6.60, -6.80, -7.00, -7.20, -7.40, -7.60, -7.80, -8.00, -8.20, -8.40, -8.60, -8.80, -9.00, -9.20, -9.40, -9.60, -9.80, -10.00, -10.20, -10.40, -10.60, -10.80, -11.00, -11.20, -11.40, -11.60, -11.80, -12.00, -12.20, -12.40, -12.60, -12.80, -13.00, -13.20, -13.40, -13.60, -13.80, -14.00, -14.20, -14.40, -14.60, -14.80, -15.00, -15.20, -15.40, -15.60, -15.80, -16.00, -16.20, -16.40, -16.60, -16.80, -17.00, -17.20, -17.40, -17.60, -17.80, -18.00, -18.20, -18.40, -18.60, -18.80, -19.00, -19.20, -19.40, -19.60, -19.80, -20.00, -20.20, -20.40, -20.60, -20.80, -21.00, -21.20, -21.40, -21.60, -21.80, -22.00, -22.20, -22.40, -22.60, -22.80, -23.00, -23.20, -23.40, -23.60, -23.80, -24.00, -24.20, -24.40, -24.60, -24.80, -25.00, -25.20, -25.40, -25.60, -25.80, -26.00, -26.20, -26.40, -26.60, -26.80, -27.00, -27.20, -27.40, -27.60, -27.80, -28.00, -28.20, -28.40, -28.60, -28.80, -29.00, -29.20, -29.40, -29.60, -29.80, -30.00, -30.20, -30.40, -30.60, -30.80, -31.00, -31.20, -31.40, -31.60, -31.80, -32.00, -32.20, -32.40, -32.60, -32.80, -33.00, -33.20, -33.40, -33.60, -33.80, -34.00, -34.20, -34.40, -34.60, -34.80, -35.00, -35.20, -35.40, -35.60, -35.80, -36.00, -36.20, -36.40, -36.60, -36.80, -37.00, -37.20, -37.40, -37.60, -37.80, -38.00, -38.20, -38.40, -38.60, -38.80, -39.00, -39.20, -39.40, -39.60, -39.80, -40.00, -40.20, -40.40, -40.60, -40.80, -41.00, -41.20, -41.40, -41.60, -41.80, -42.00, -42.20, -42.40, -42.60, -42.80, -43.00, -43.20, -43.40, -43.60, -43.80, -44.00, -44.20, -44.40, -44.60, -44.80, -45.00, -45.20, -45.40, -45.60, -45.80, -46.00, -46.20, -46.40, -46.60, -46.80, -47.00, -47.20, -47.40, -47.60, -47.80, -48.00, -48.20, -48.40, -48.60, -48.80, -49.00, -49.20, -49.40, -49.60, -49.80, 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